US011639129B2

(12) **United States Patent**
Garceau

(10) **Patent No.: US 11,639,129 B2**
(45) **Date of Patent: May 2, 2023**

(54) **SLIDABLE ROOM ASSEMBLIES**

(71) Applicant: **NORCO INDUSTRIES, INC.**, Compton, CA (US)

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(73) Assignee: **NORCO INDUSTRIES, INC.**, Compton, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 416 days.

(21) Appl. No.: **16/570,136**

(22) Filed: **Sep. 13, 2019**

(65) **Prior Publication Data**

US 2020/0062164 A1 Feb. 27, 2020

Related U.S. Application Data

(63) Continuation-in-part of application No. 16/136,528, filed on Sep. 20, 2018, now abandoned.

(60) Provisional application No. 62/858,712, filed on Jun. 7, 2019, provisional application No. 62/732,330, filed on Sep. 17, 2018, provisional application No. 62/562,084, filed on Sep. 22, 2017.

(51) **Int. Cl.**
B60P 3/34 (2006.01)
F16H 7/06 (2006.01)

(52) **U.S. Cl.**
CPC . ***B60P 3/34*** (2013.01); ***F16H 7/06*** (2013.01)

(58) **Field of Classification Search**
CPC F16H 19/0618; B60P 3/34
USPC ... 296/26.13, 26.01, 26.08, 26.09, 165, 171, 296/172, 173, 175, 176
See application file for complete search history.

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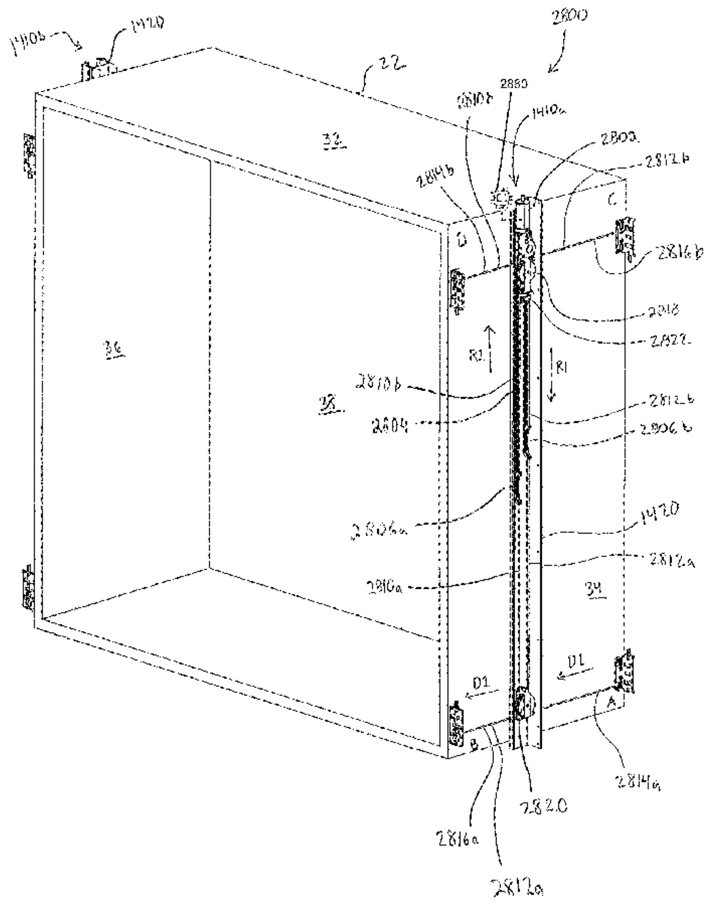
Primary Examiner — Hilary L Gutman
(74) *Attorney, Agent, or Firm* — Vorys, Sater, Seymour and Pease LLP; Jacob M. Busch, Esq.

(57) **ABSTRACT**

A slide-out unit drive assembly for a vehicle body having an opening formed in an exterior wall and a reciprocable slide-out unit disposed in the opening and slidable between a retracted position and an extended position. Sliding movement of the slide-out unit is controlled by the drive assembly at least partially arranged within the jambs. The drive assembly may include one or more drive cables extending connected to the slide-out. The drive assembly may include drive chain that actuates one or more of the drive cables, or the drive assembly may include a drive nut that actuates one or more of the drive cables, or the drive assembly may include a block and tackle assembly that actuates one or more of the drive cables. Sliding movement of the slide-out unit may be either motor driven or manually powered.

27 Claims, 59 Drawing Sheets



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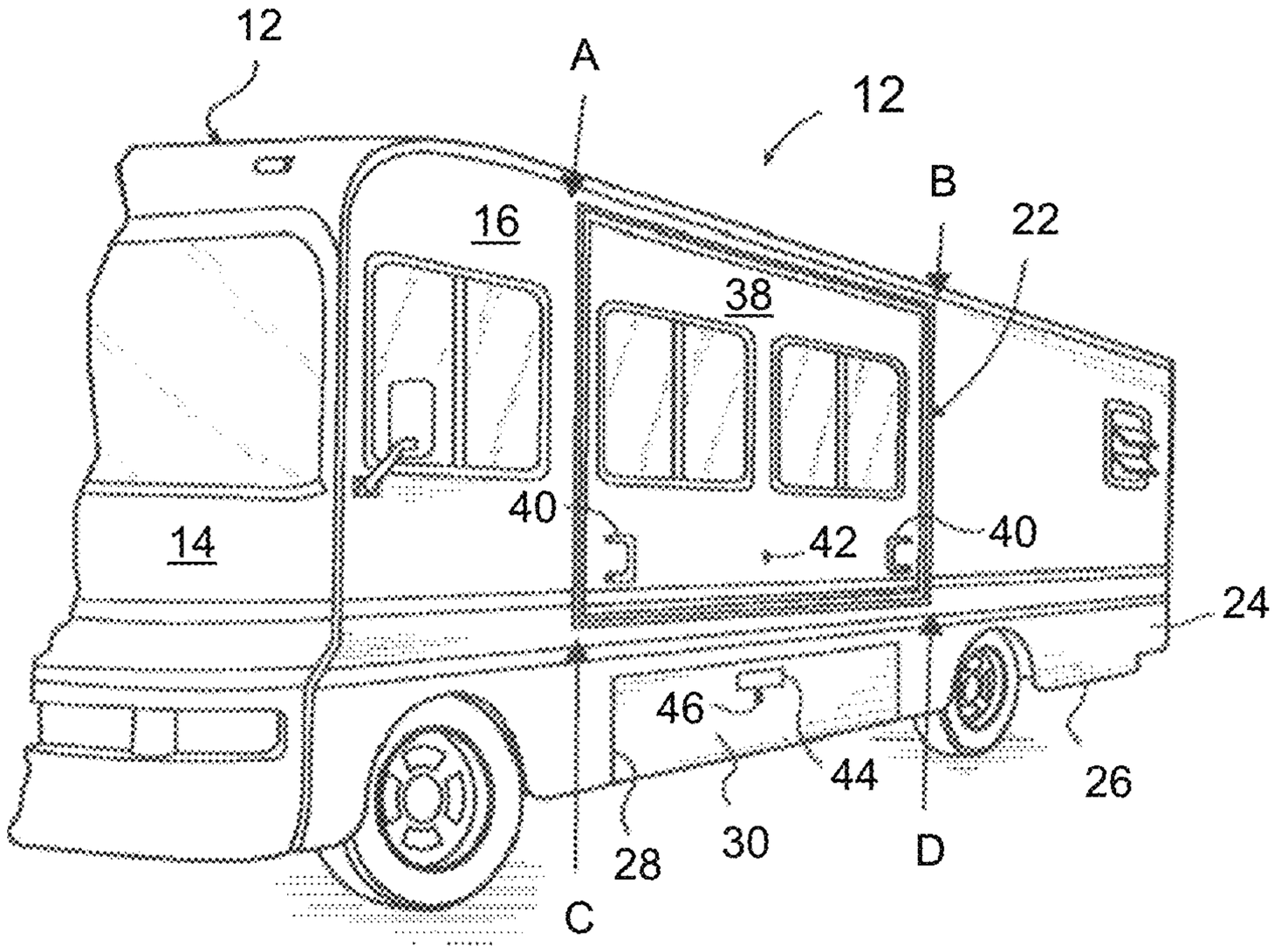
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FIG.1

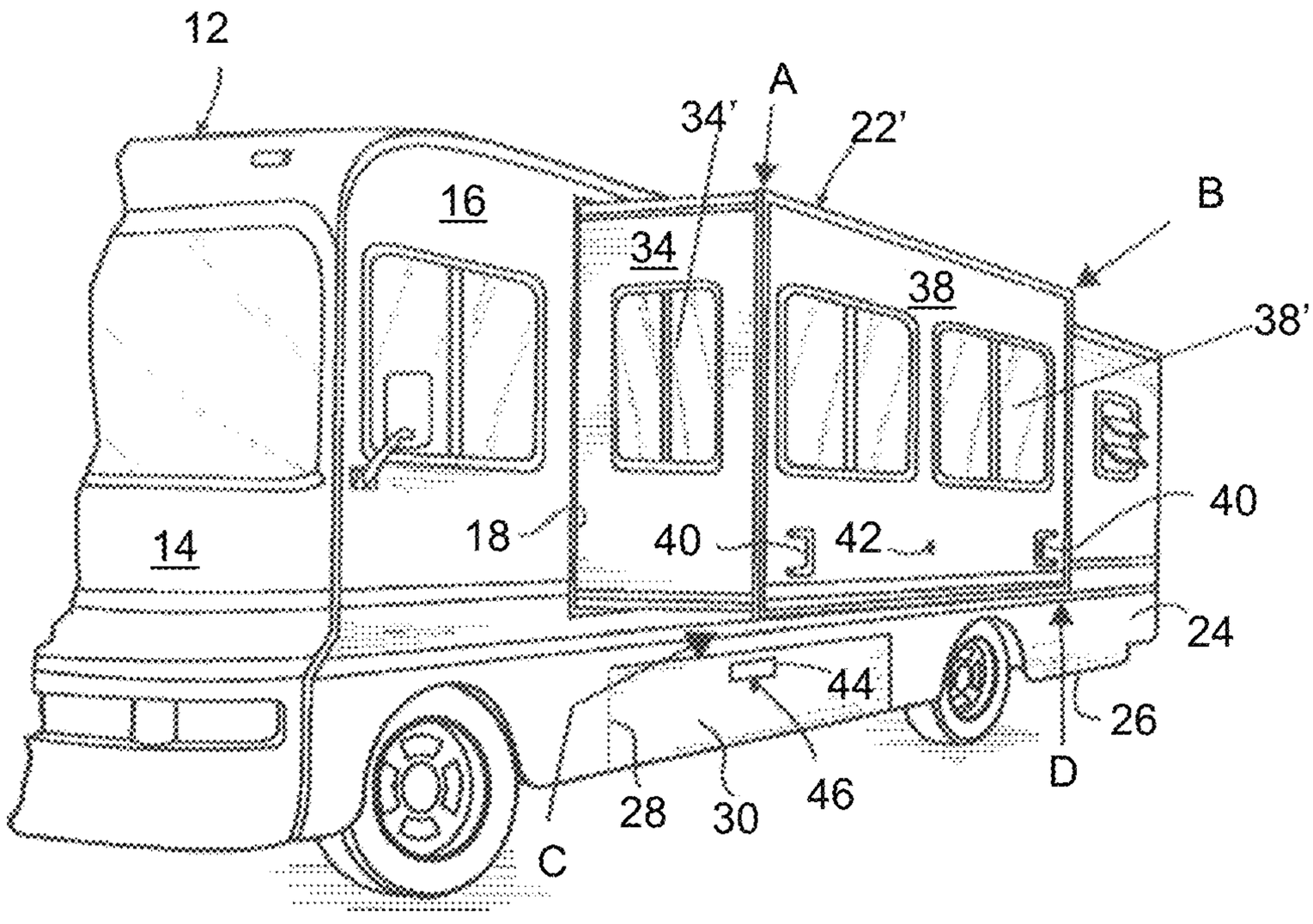
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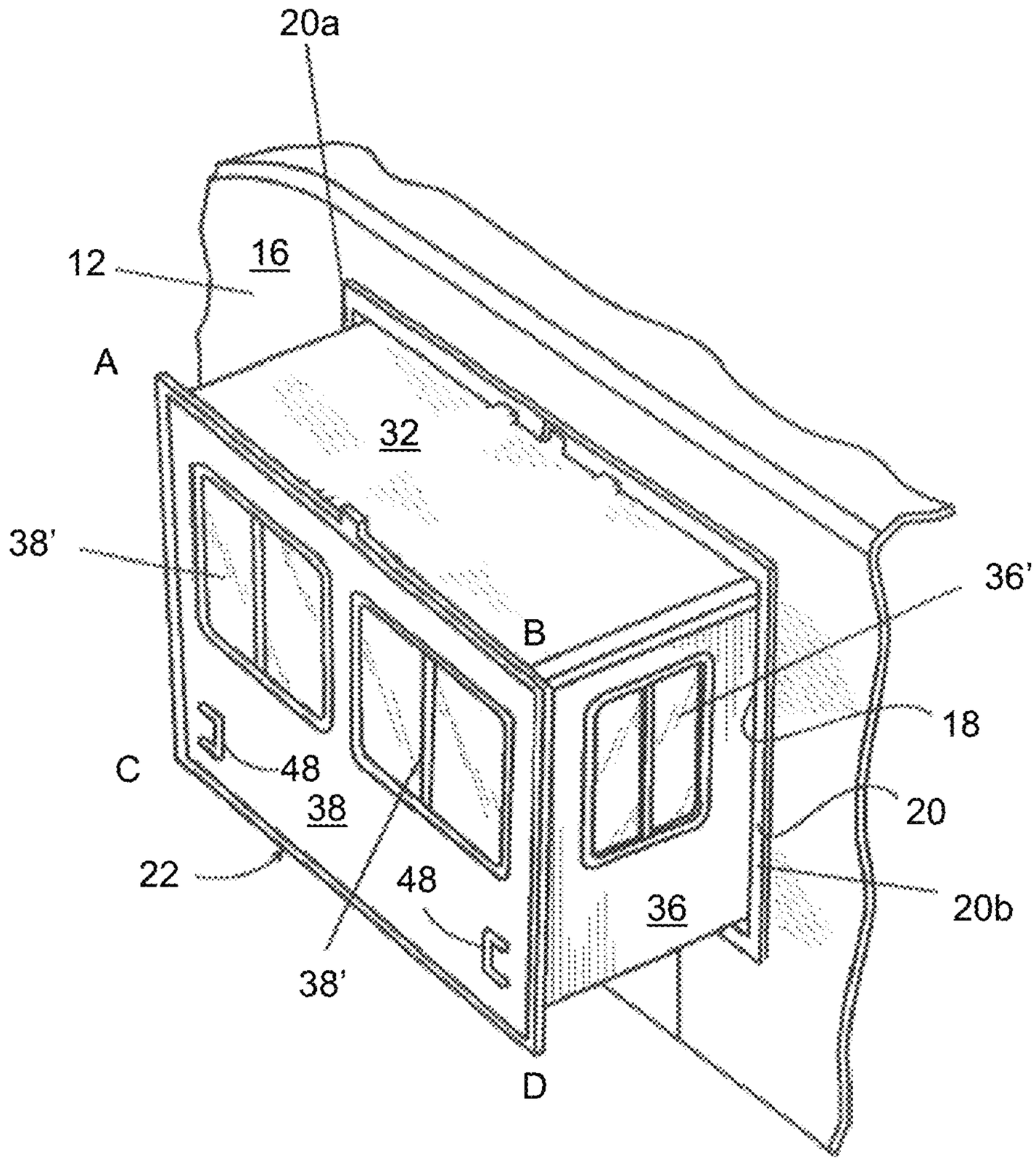
FIG.2



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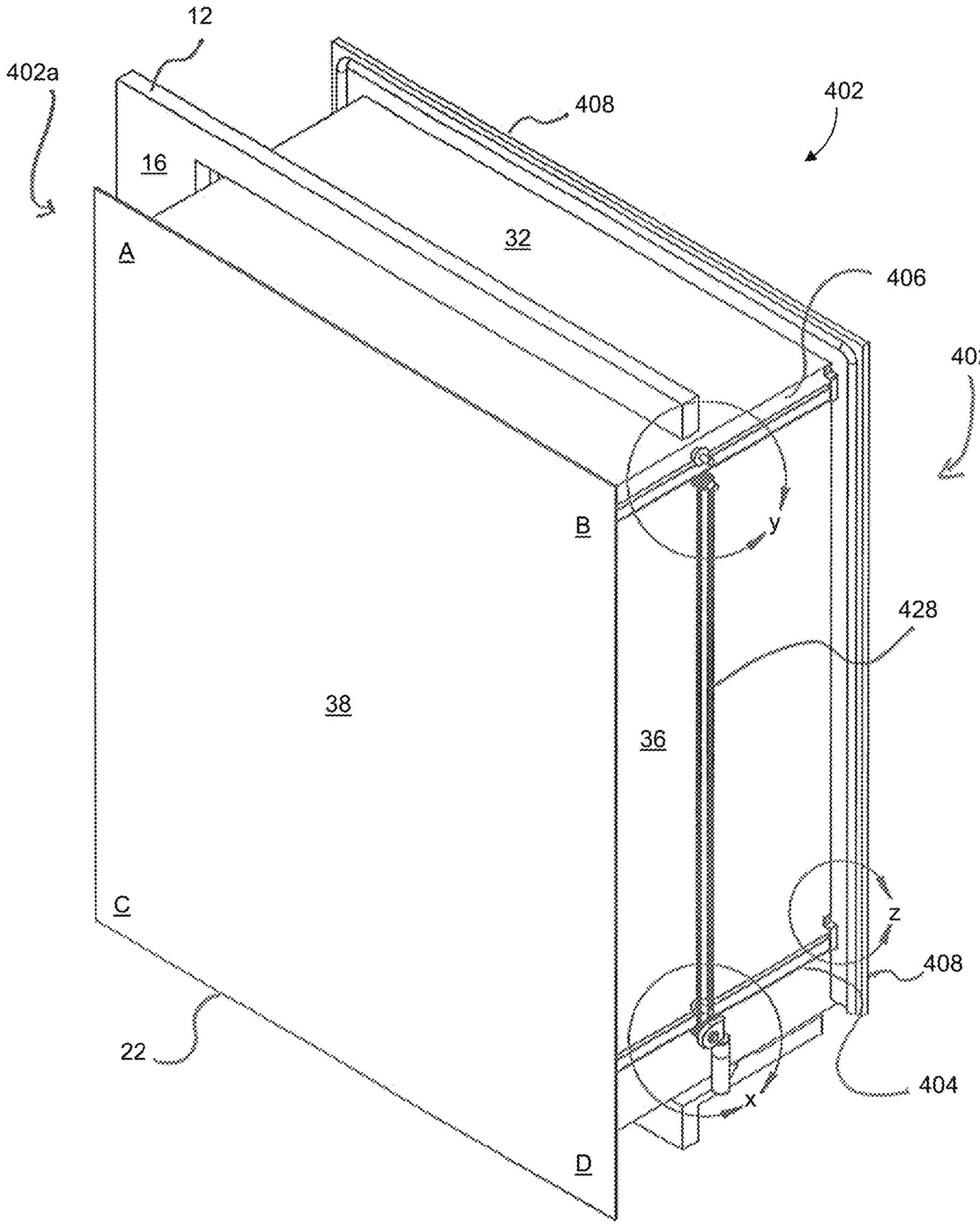

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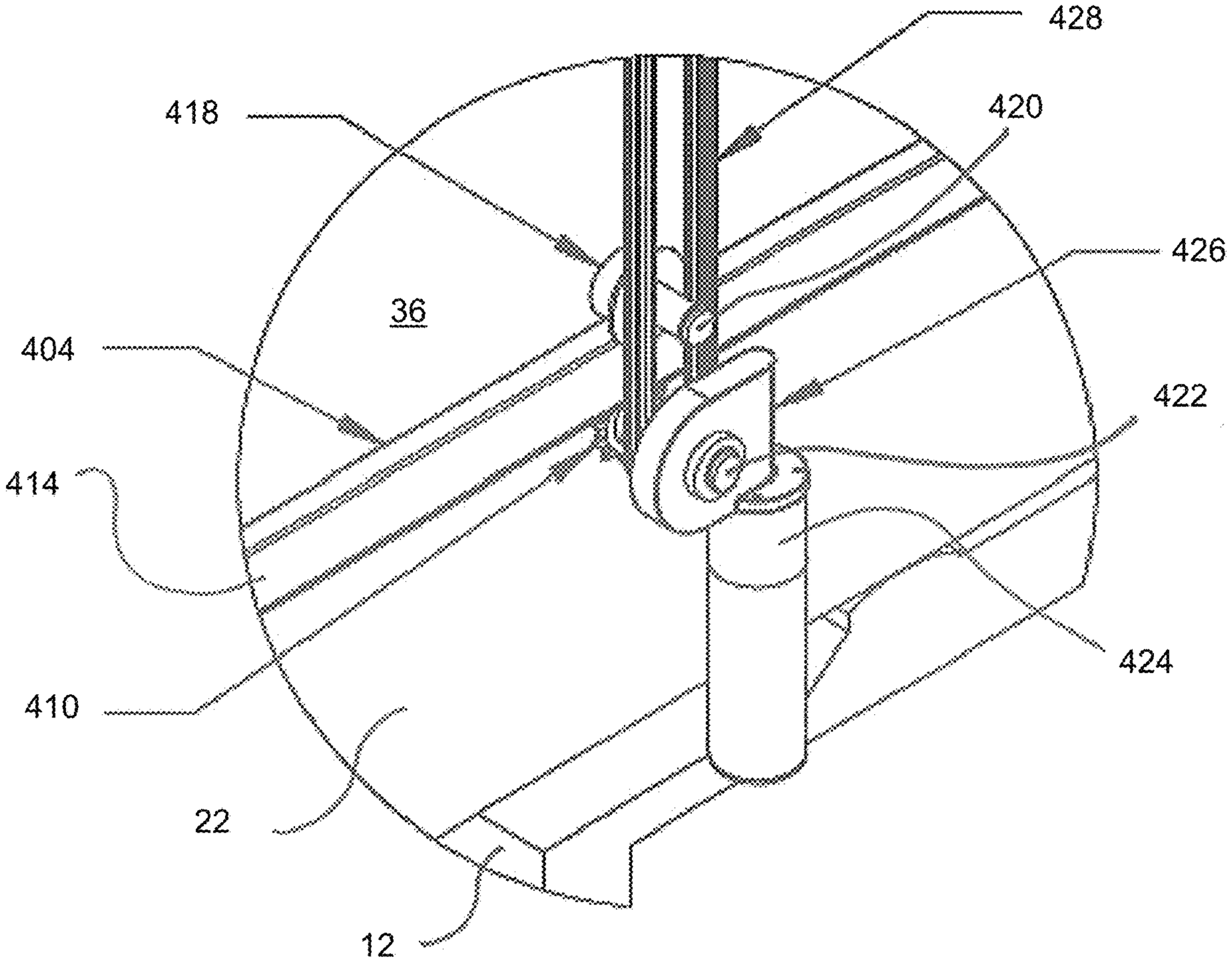

FIG.5A

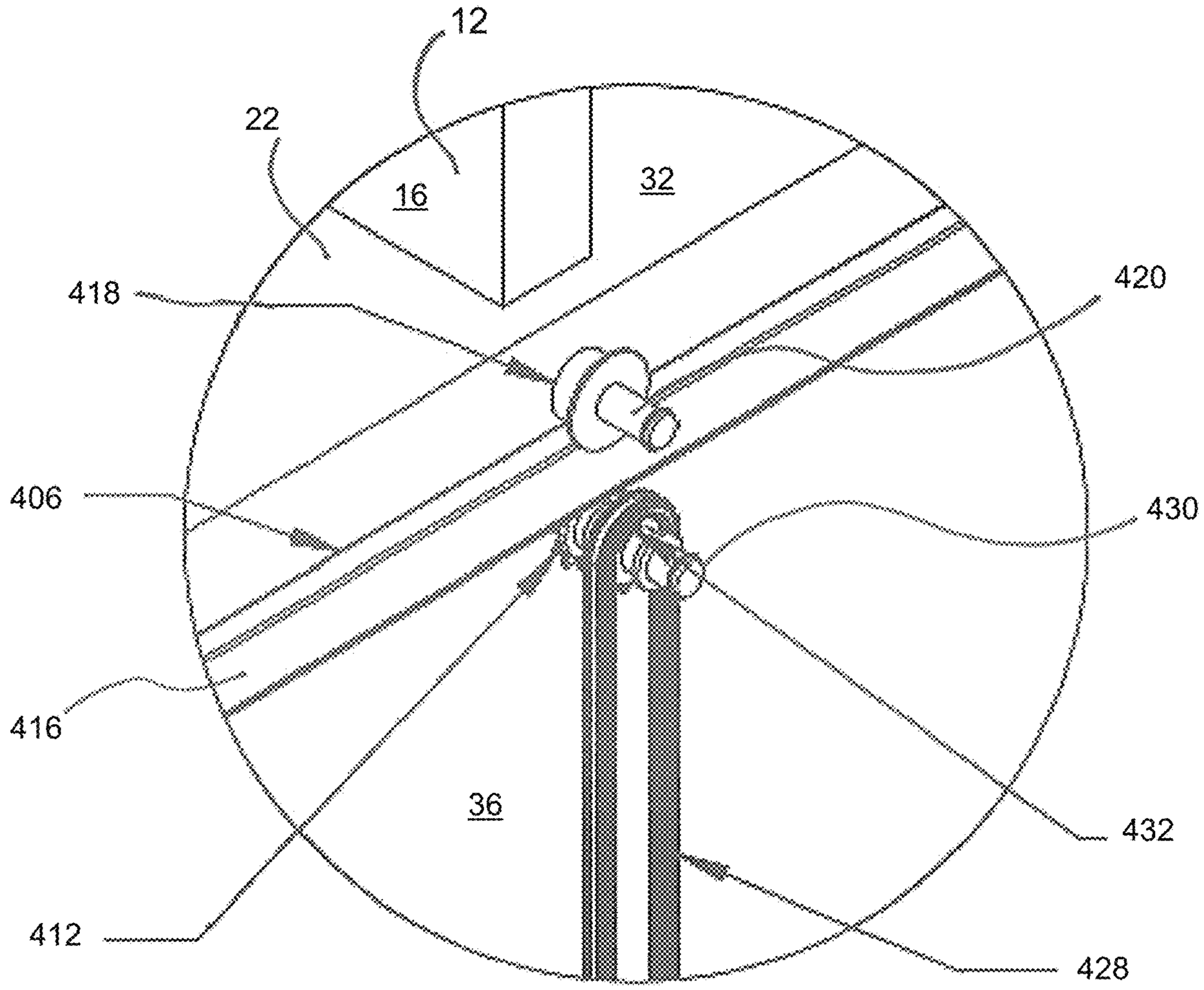

FIG.5B

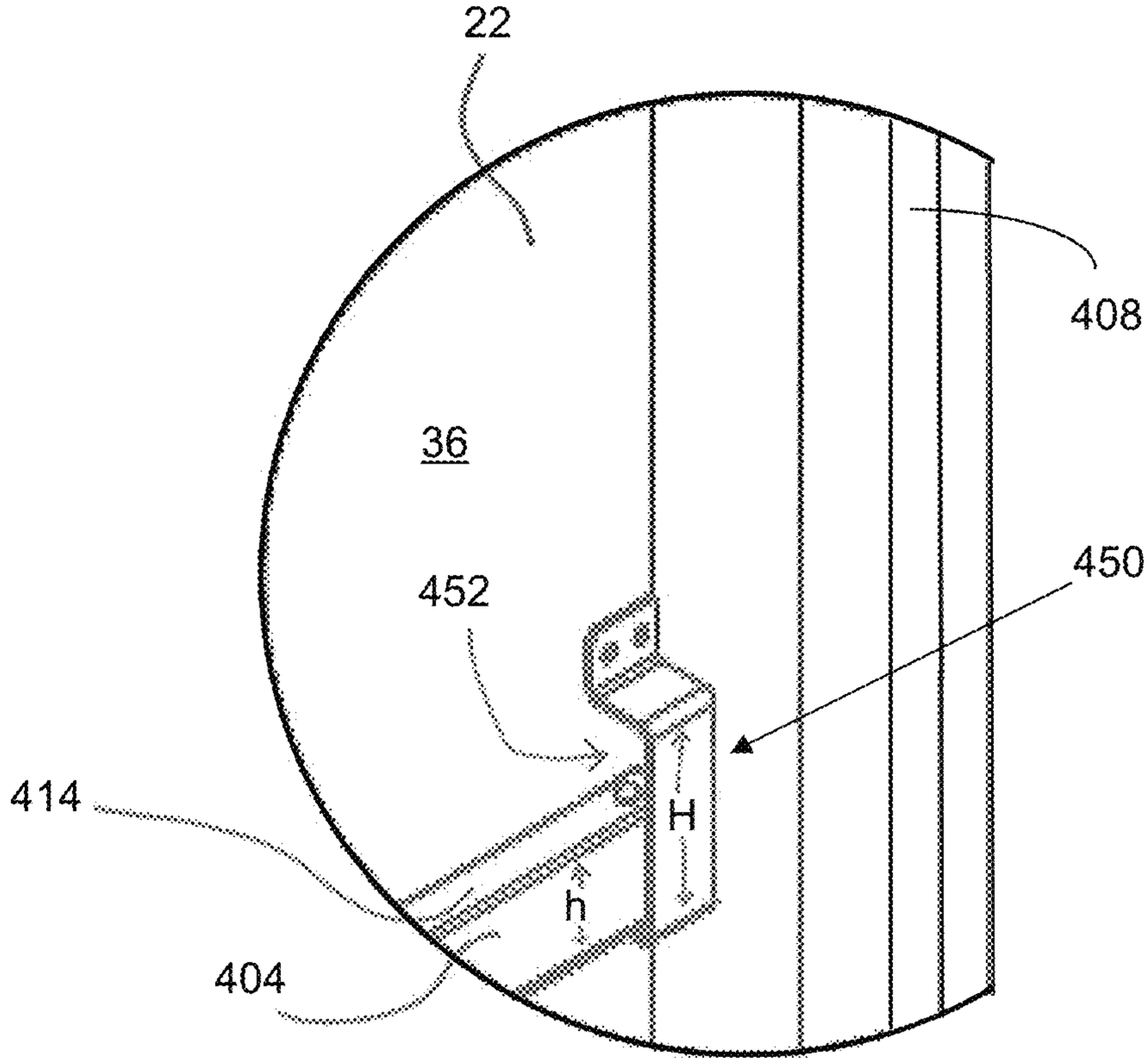

FIG.5C

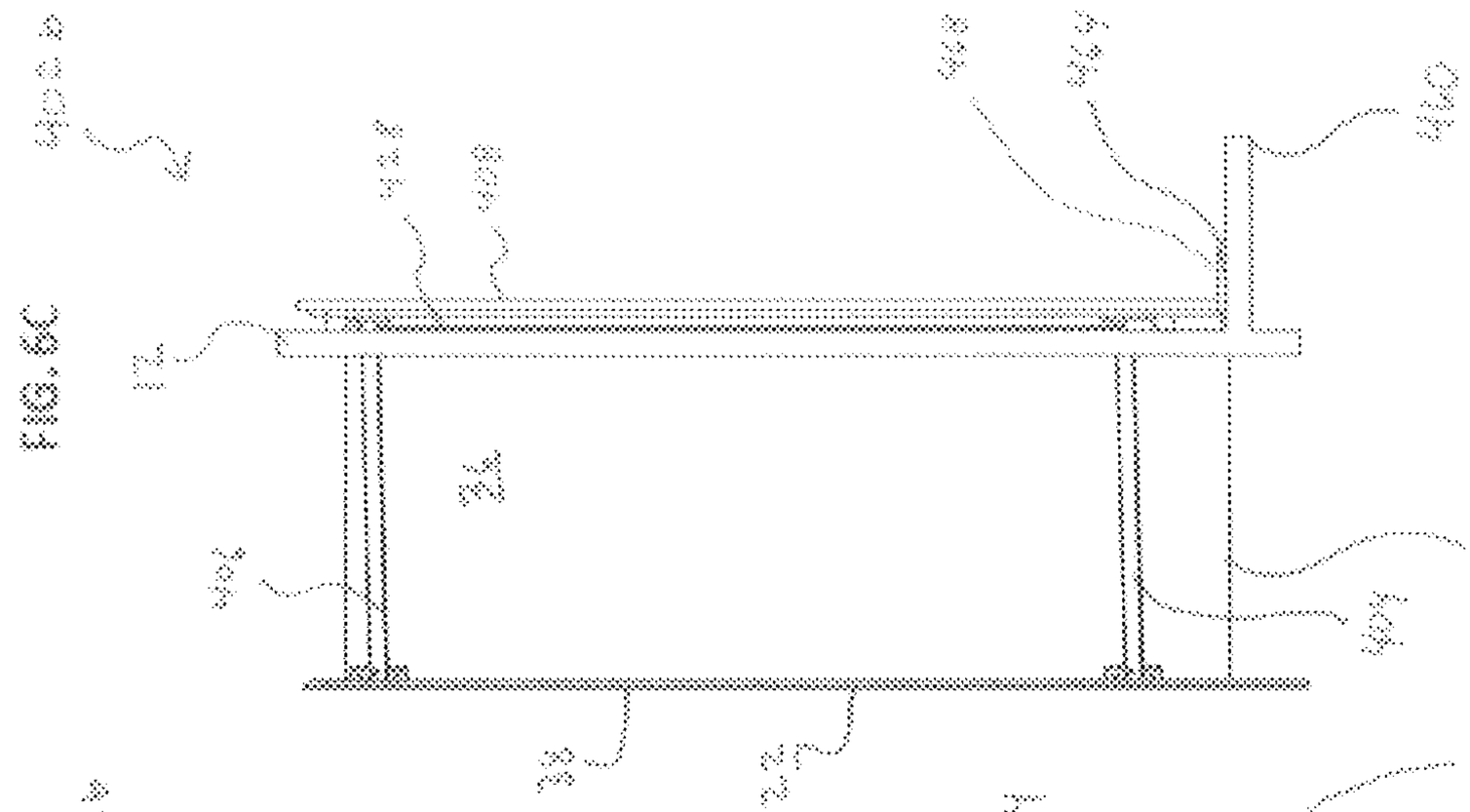
FIG. 6C
FIG. 6B
FIG. 6A

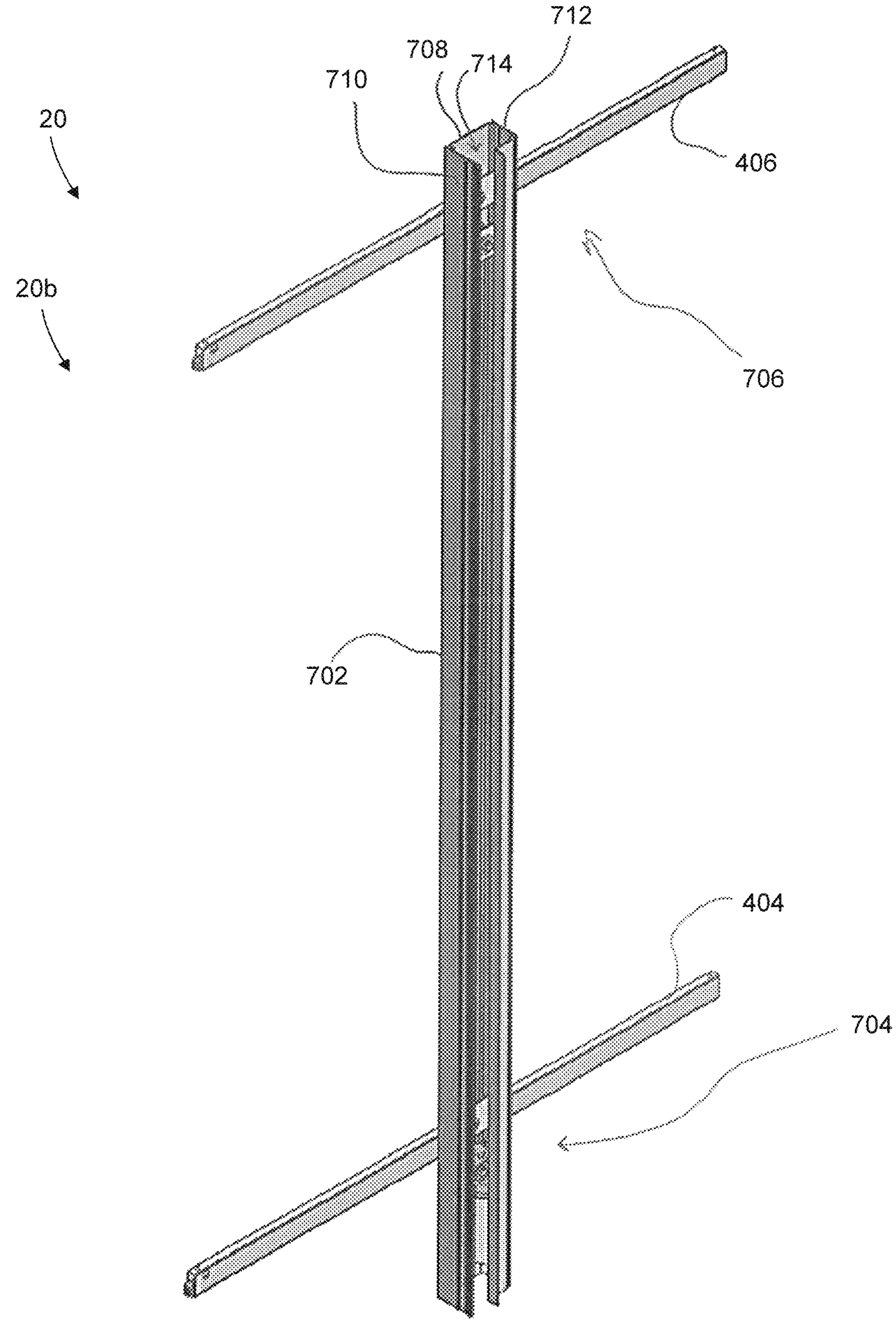

FIG.7A

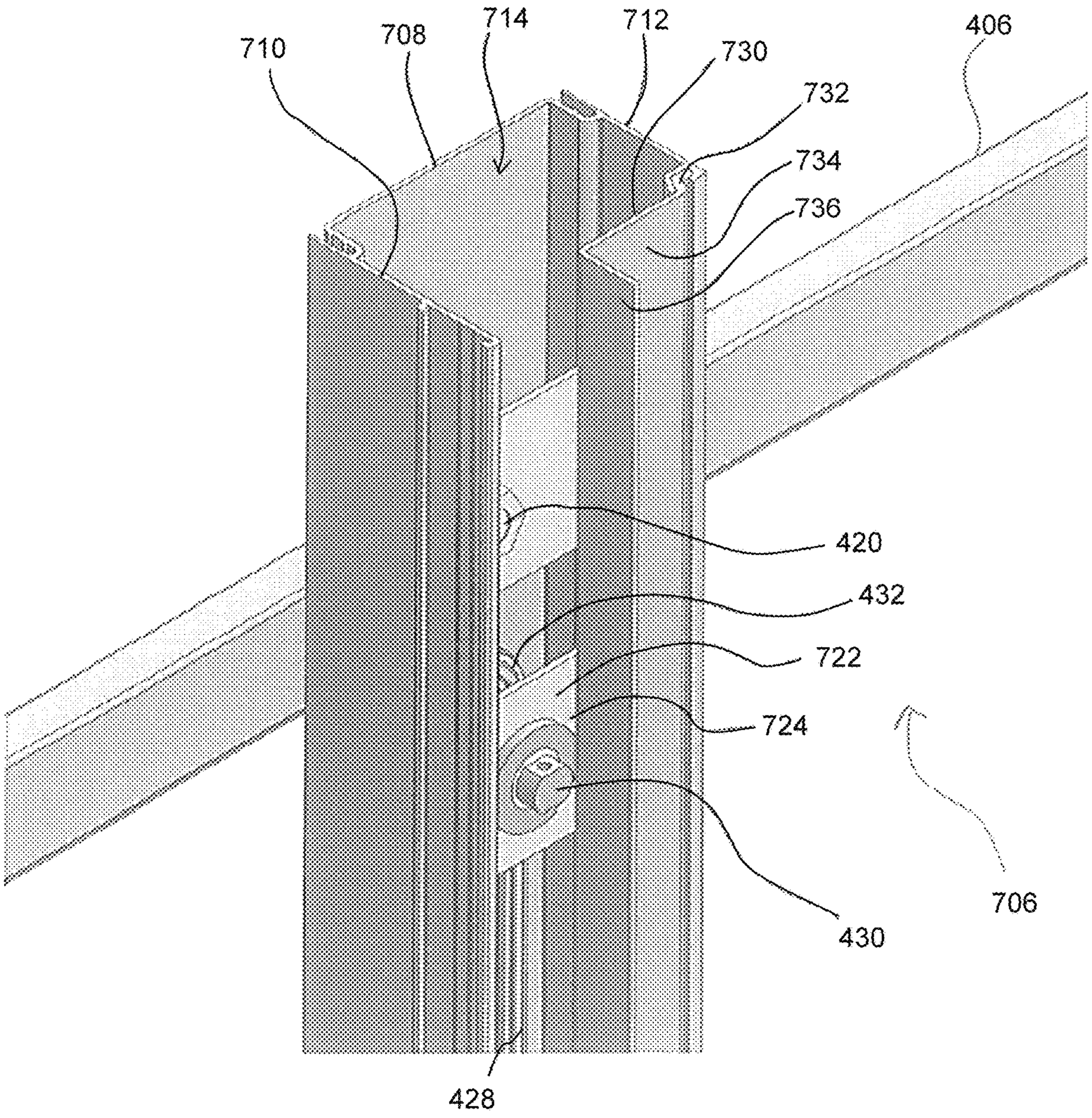

FIG.7B

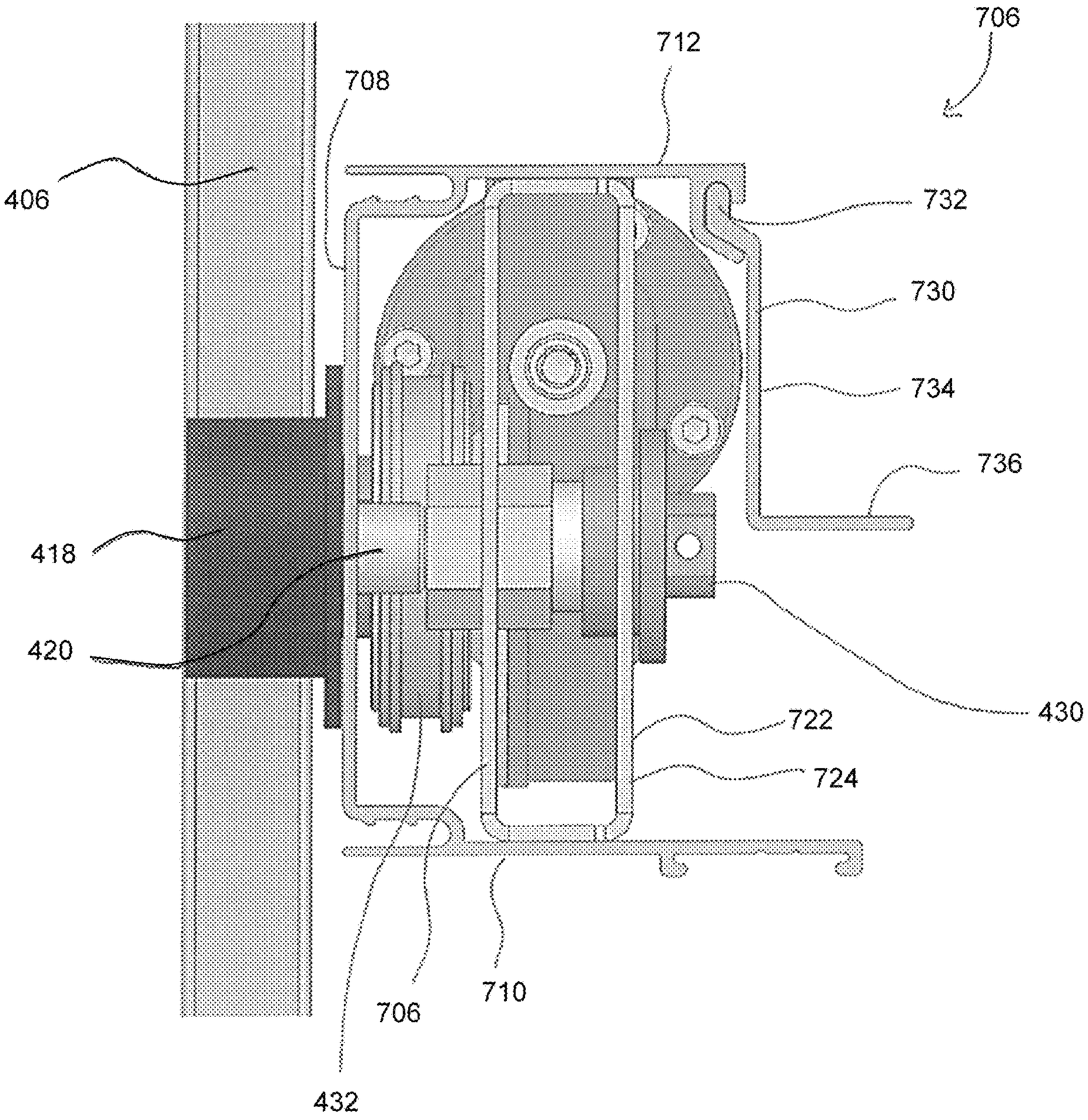

FIG.7C

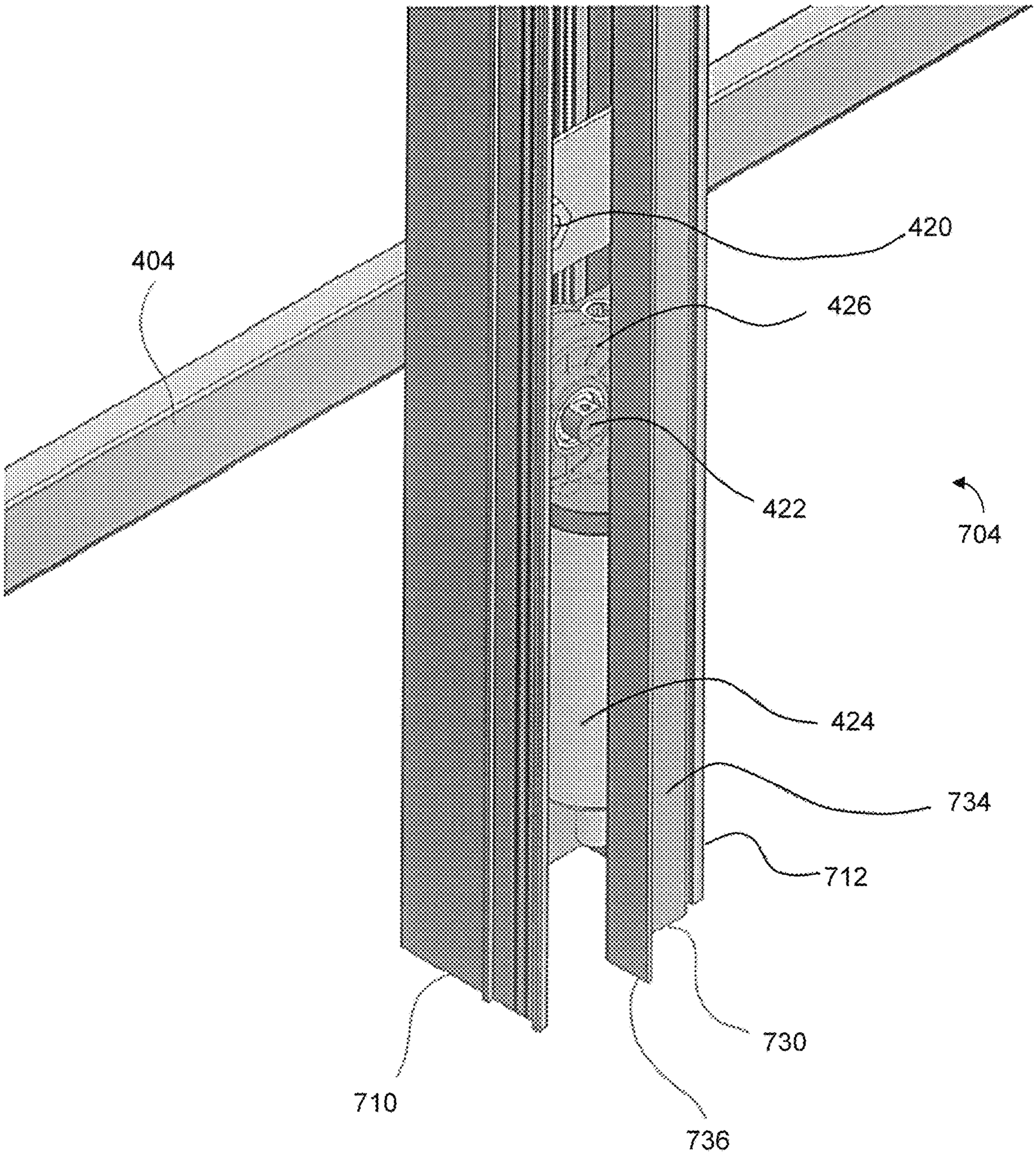

FIG.7D

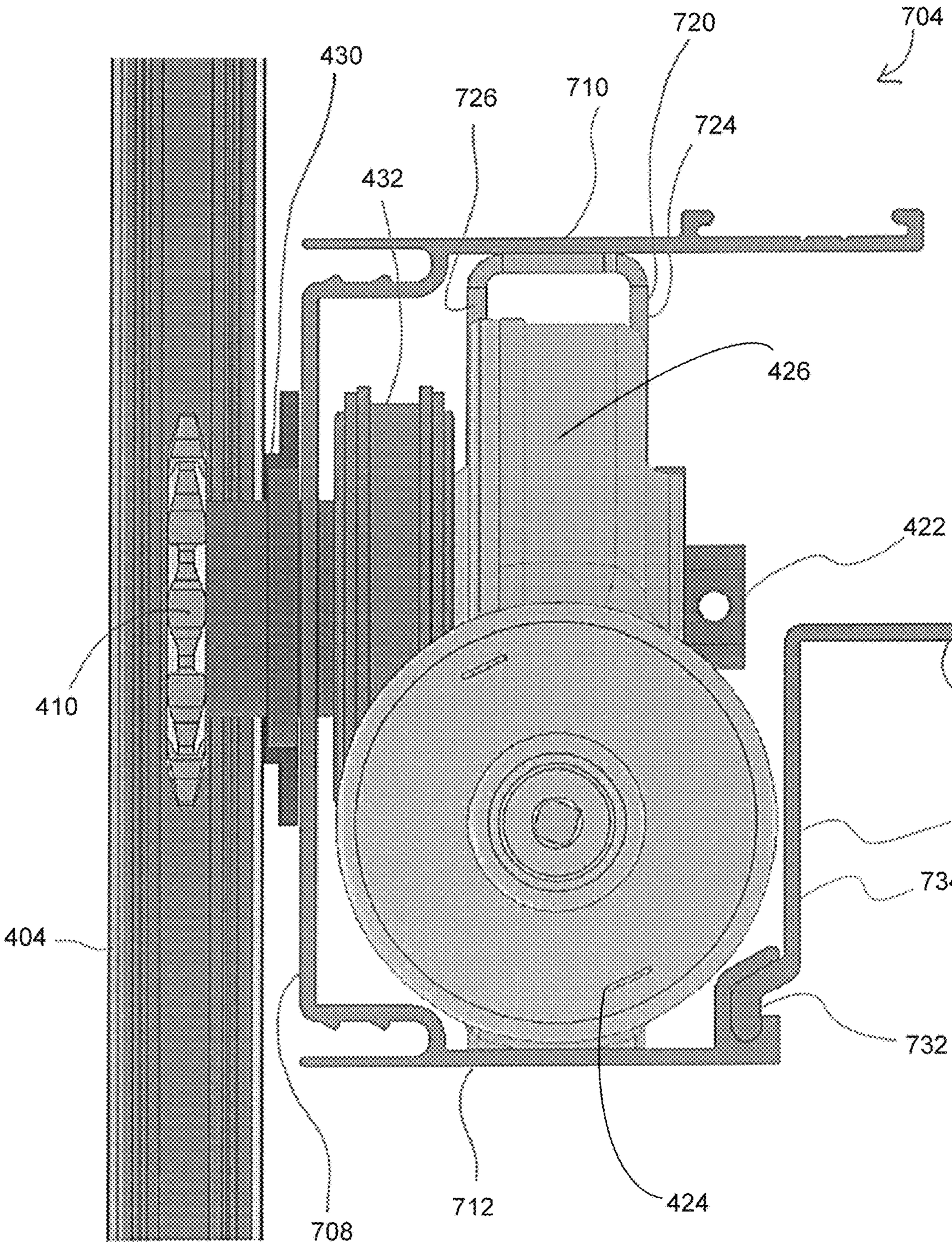
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FIG.7E

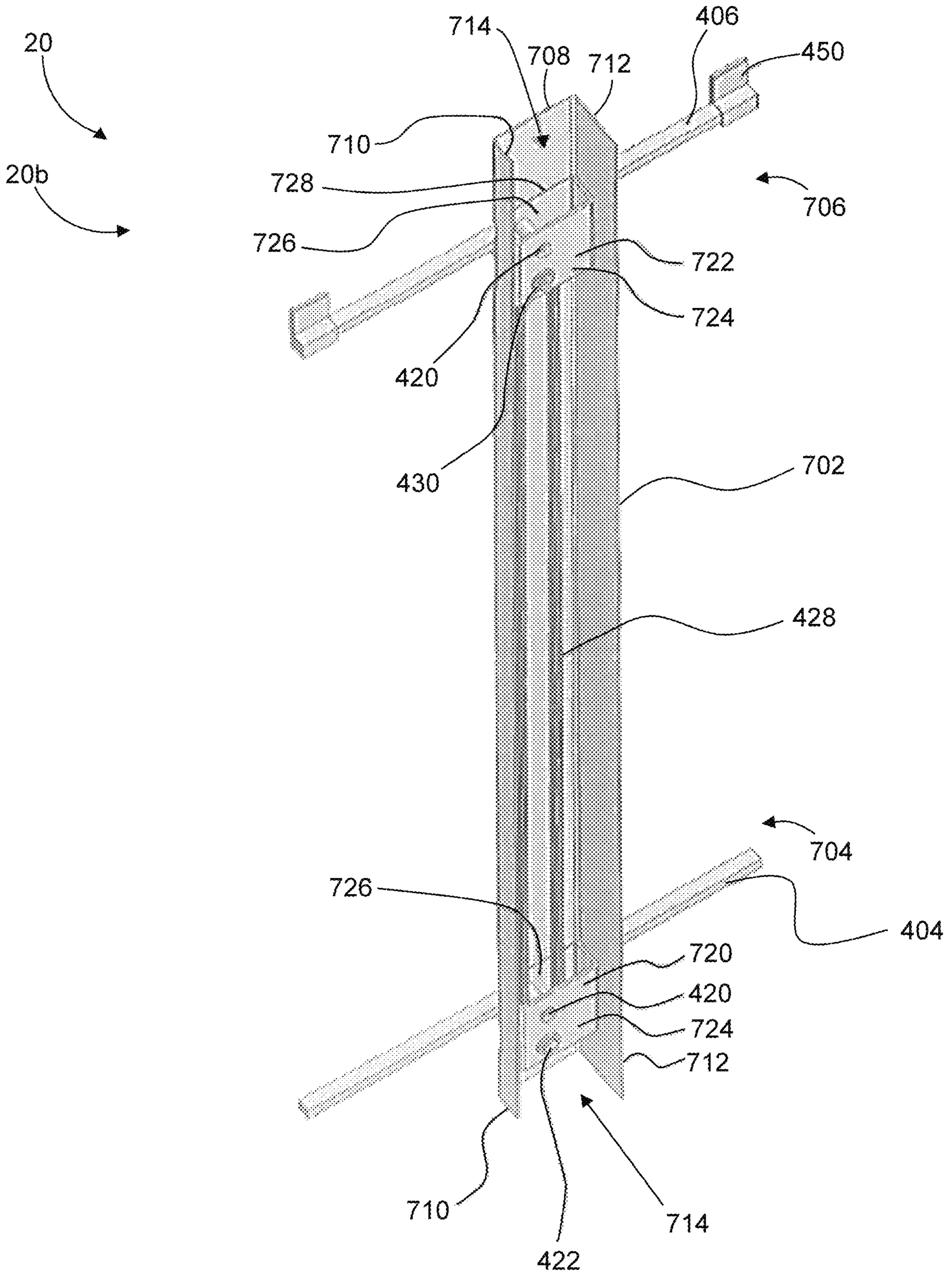
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FIG.7F

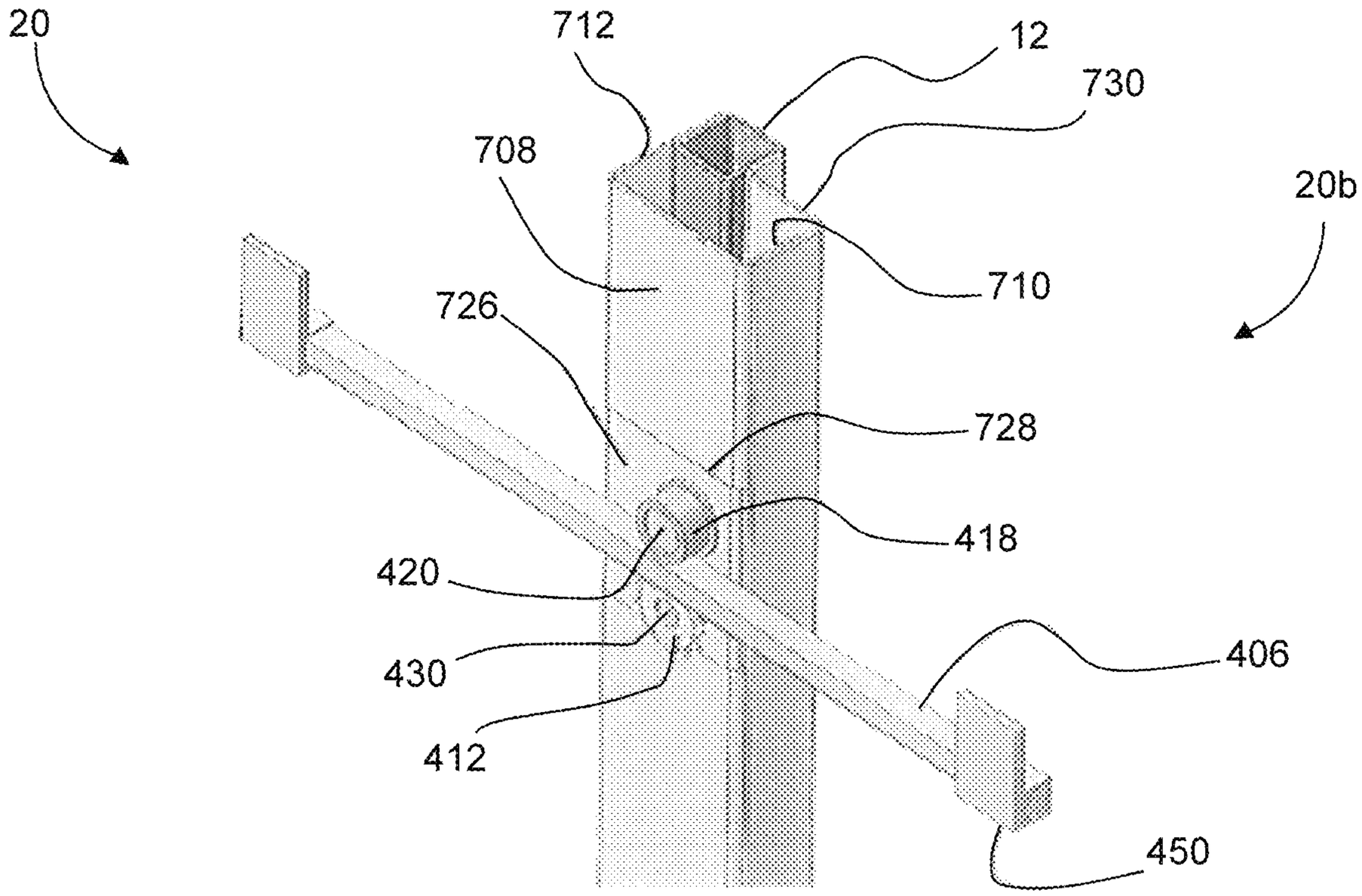
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FIG.7G

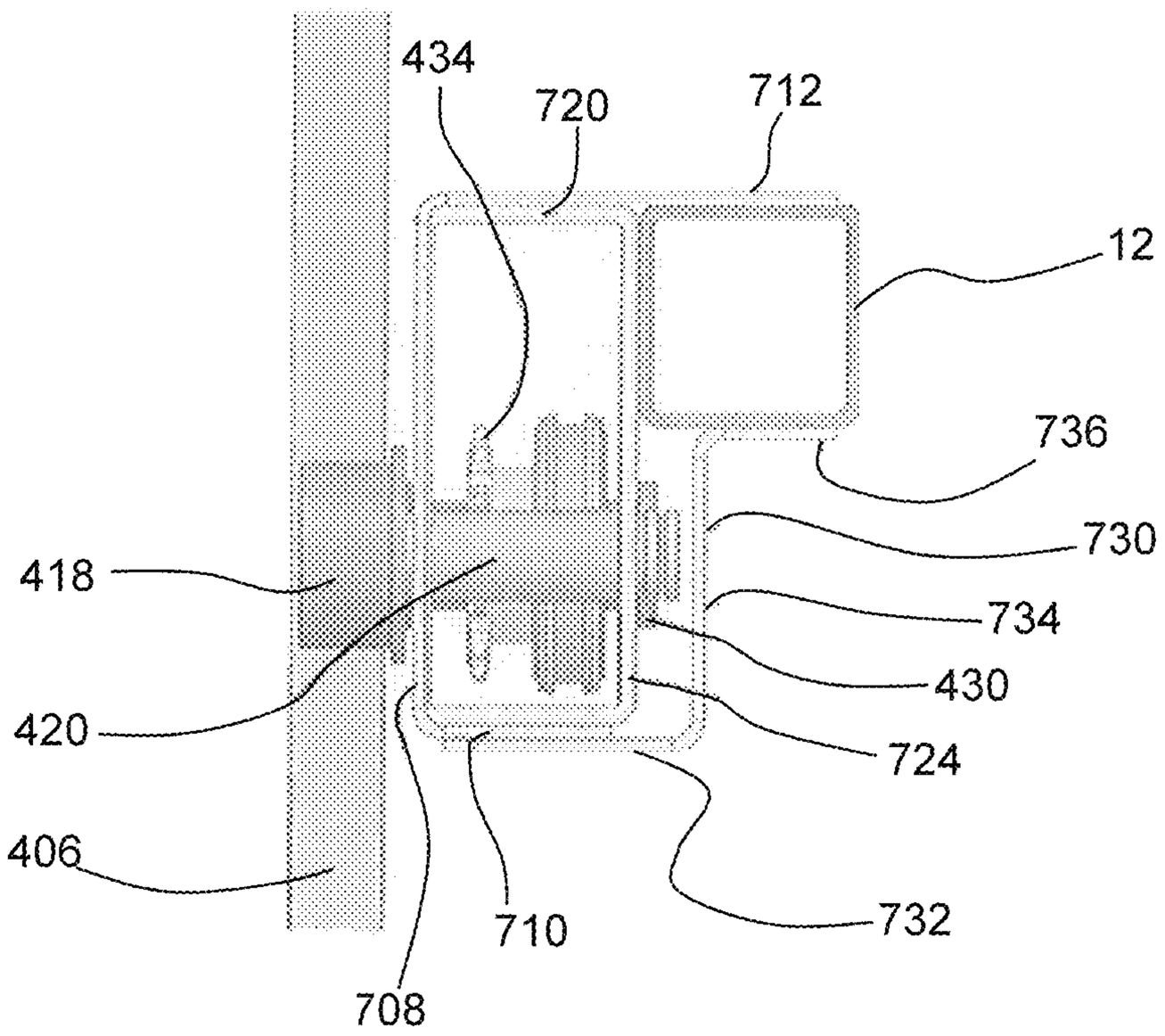
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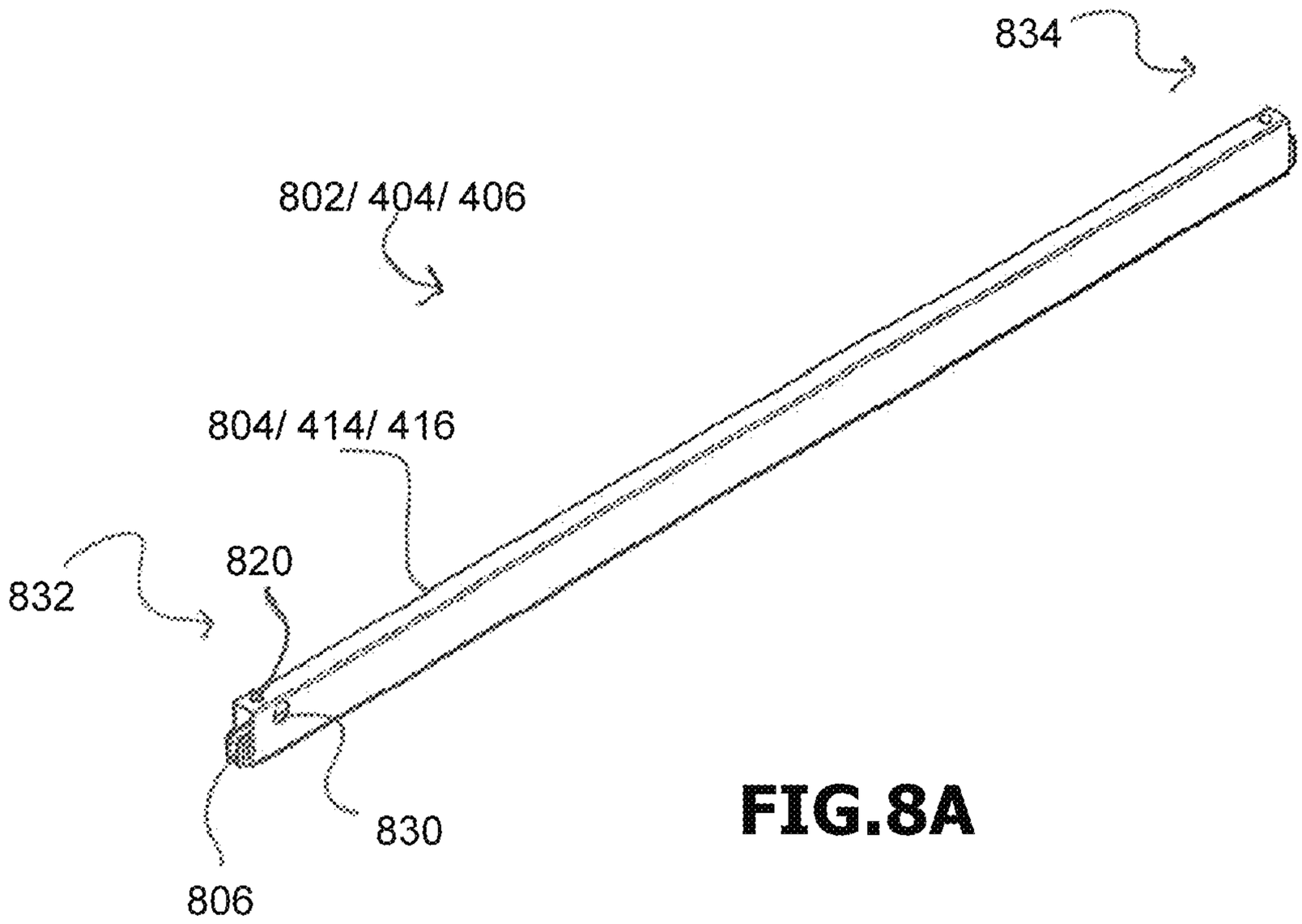
FIG.7H



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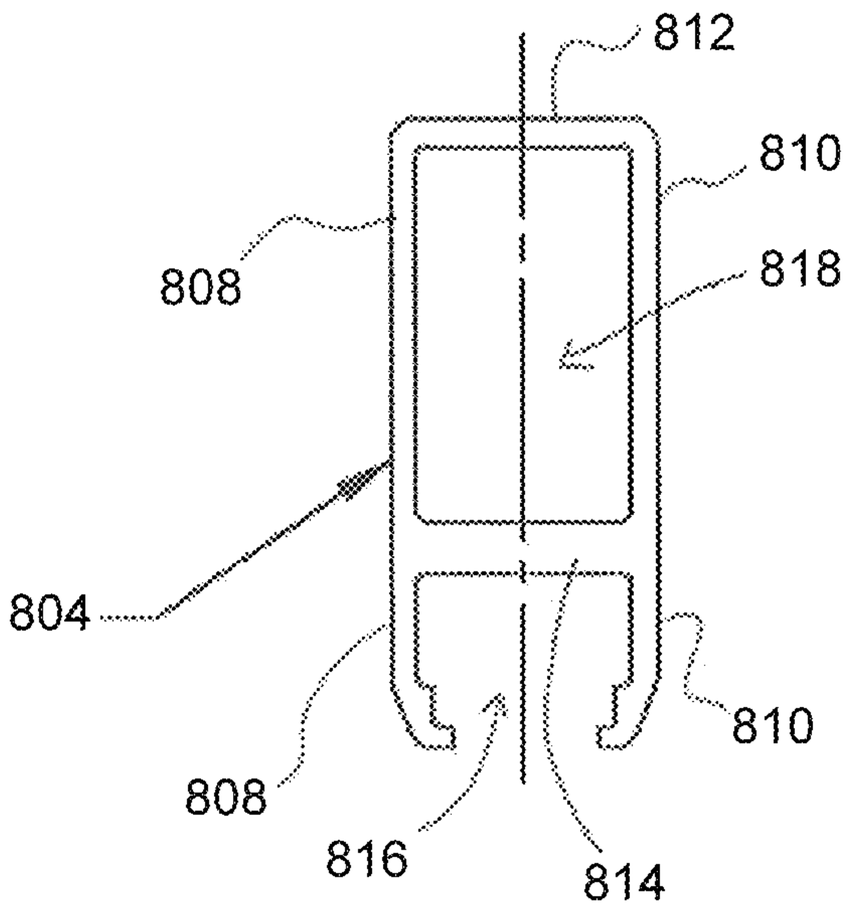

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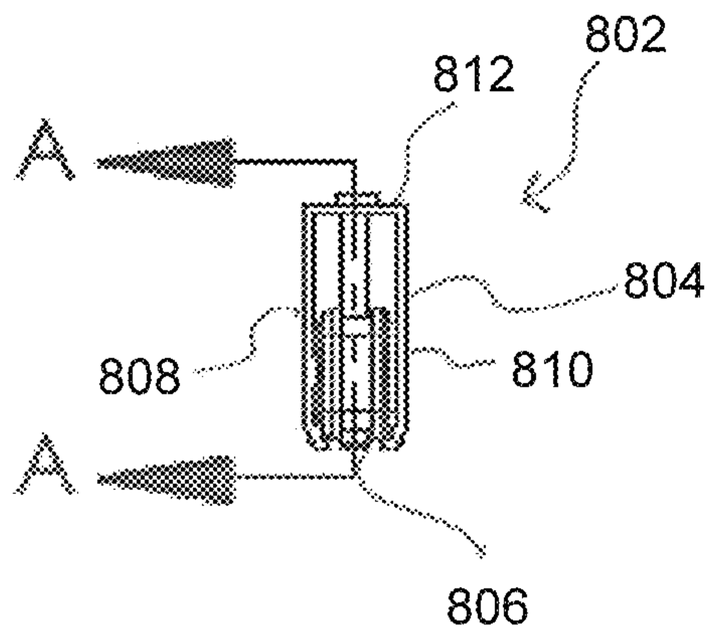

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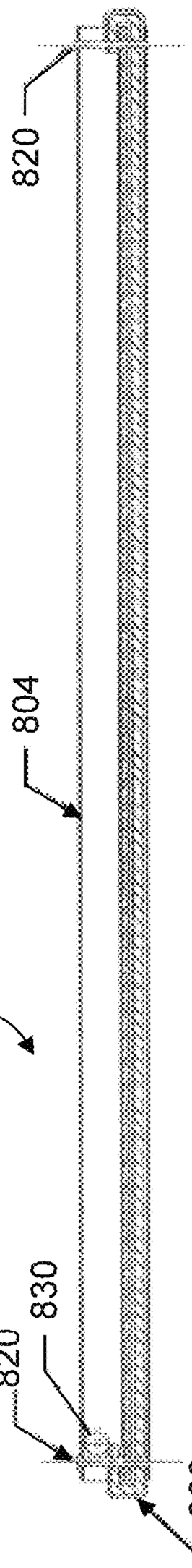

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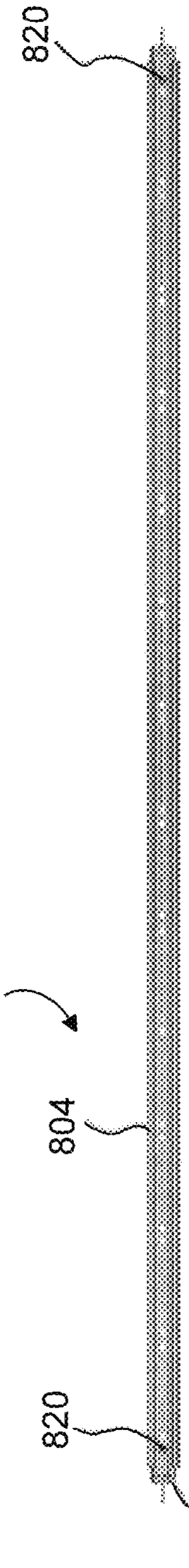

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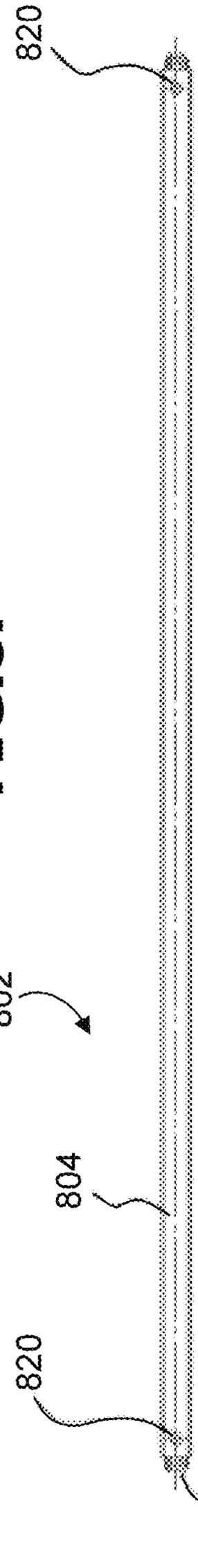

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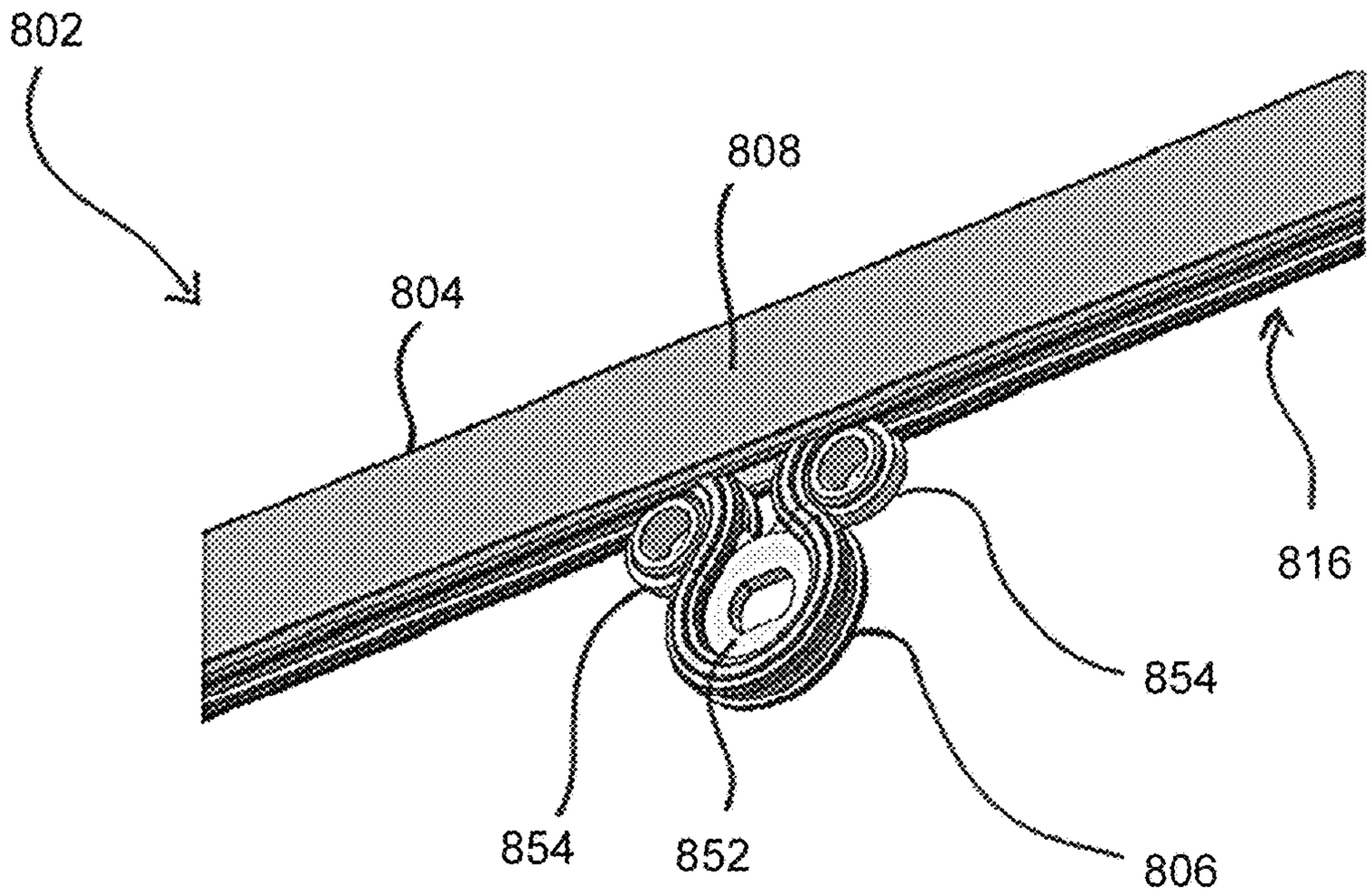

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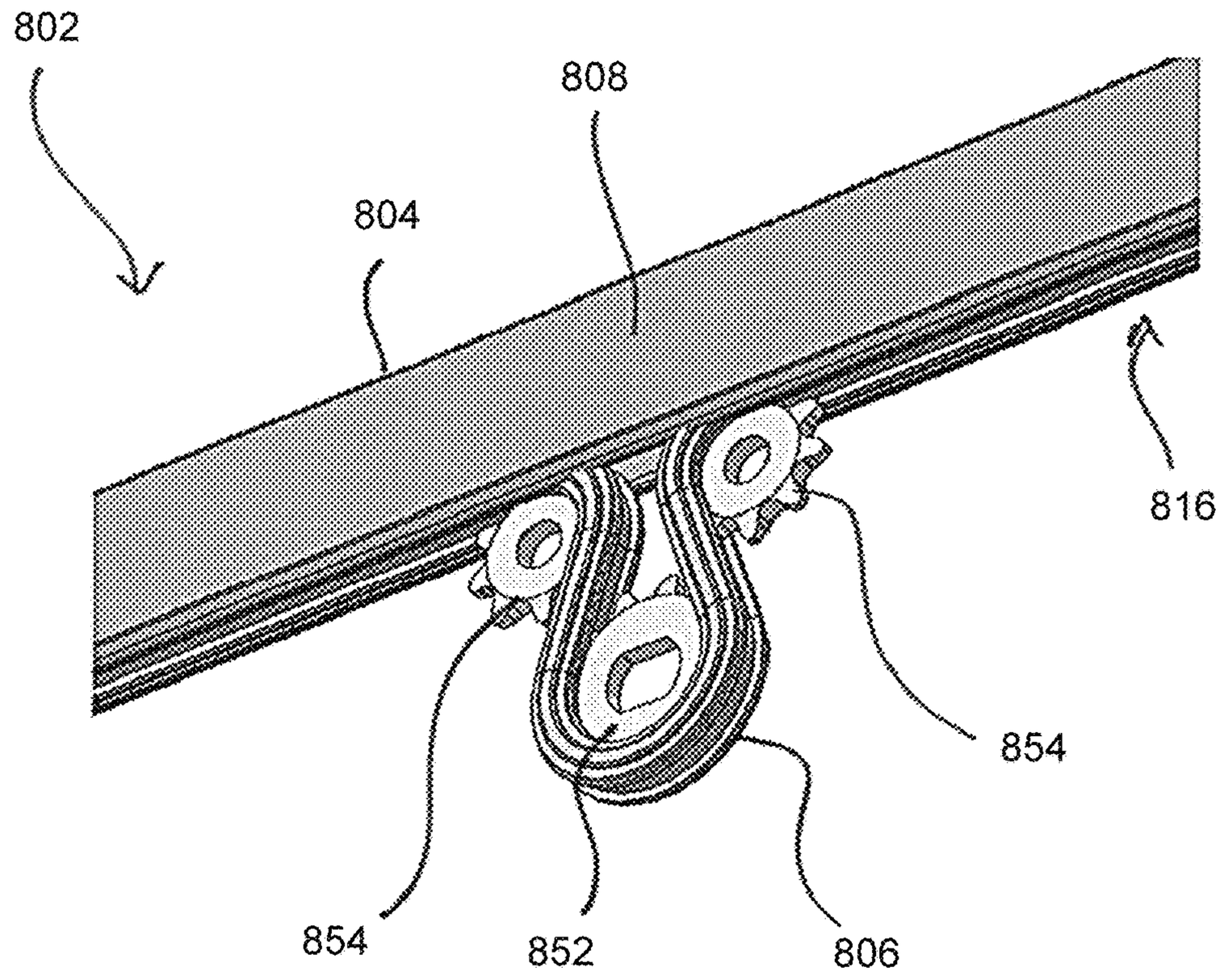

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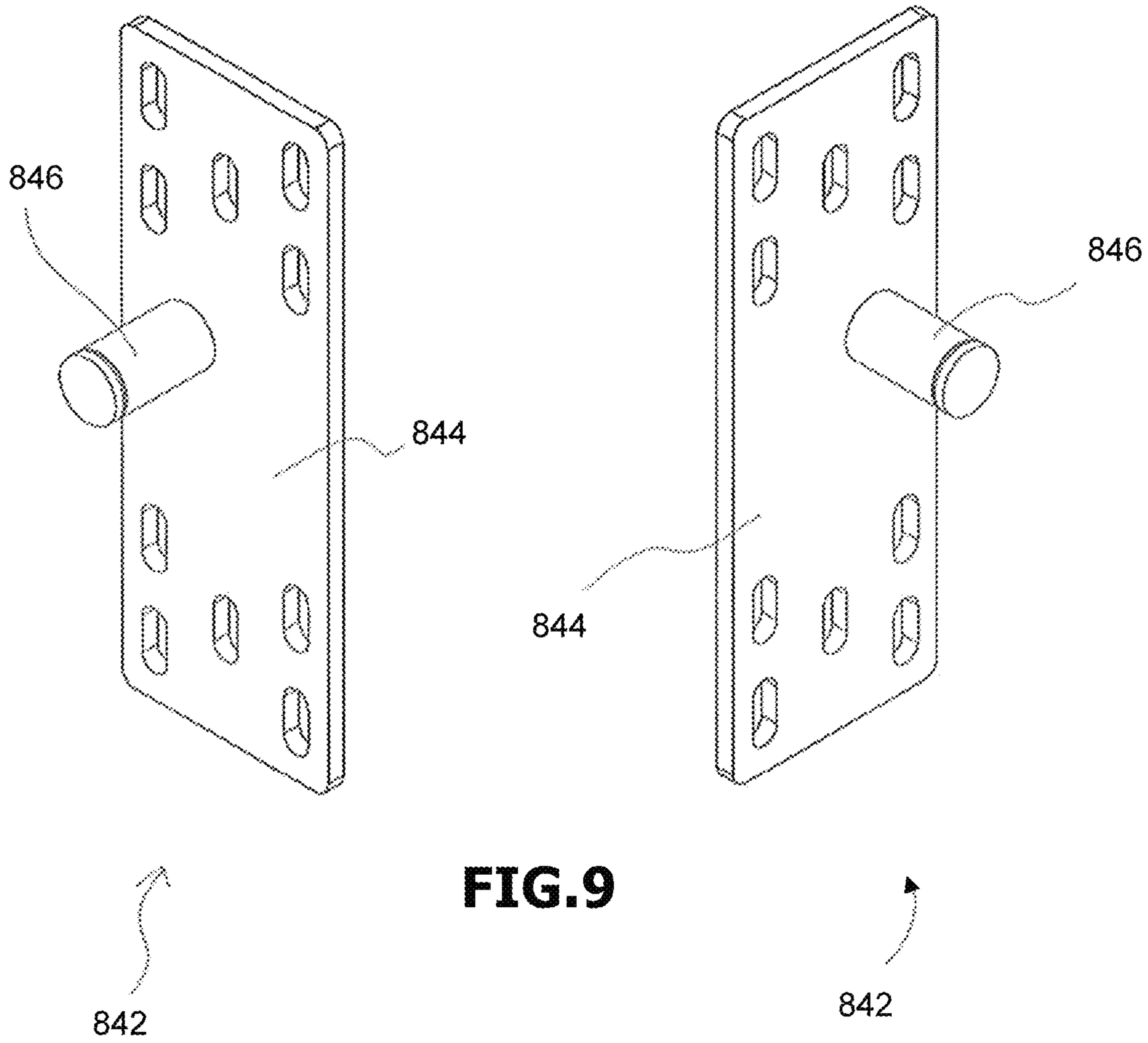


FIG.9

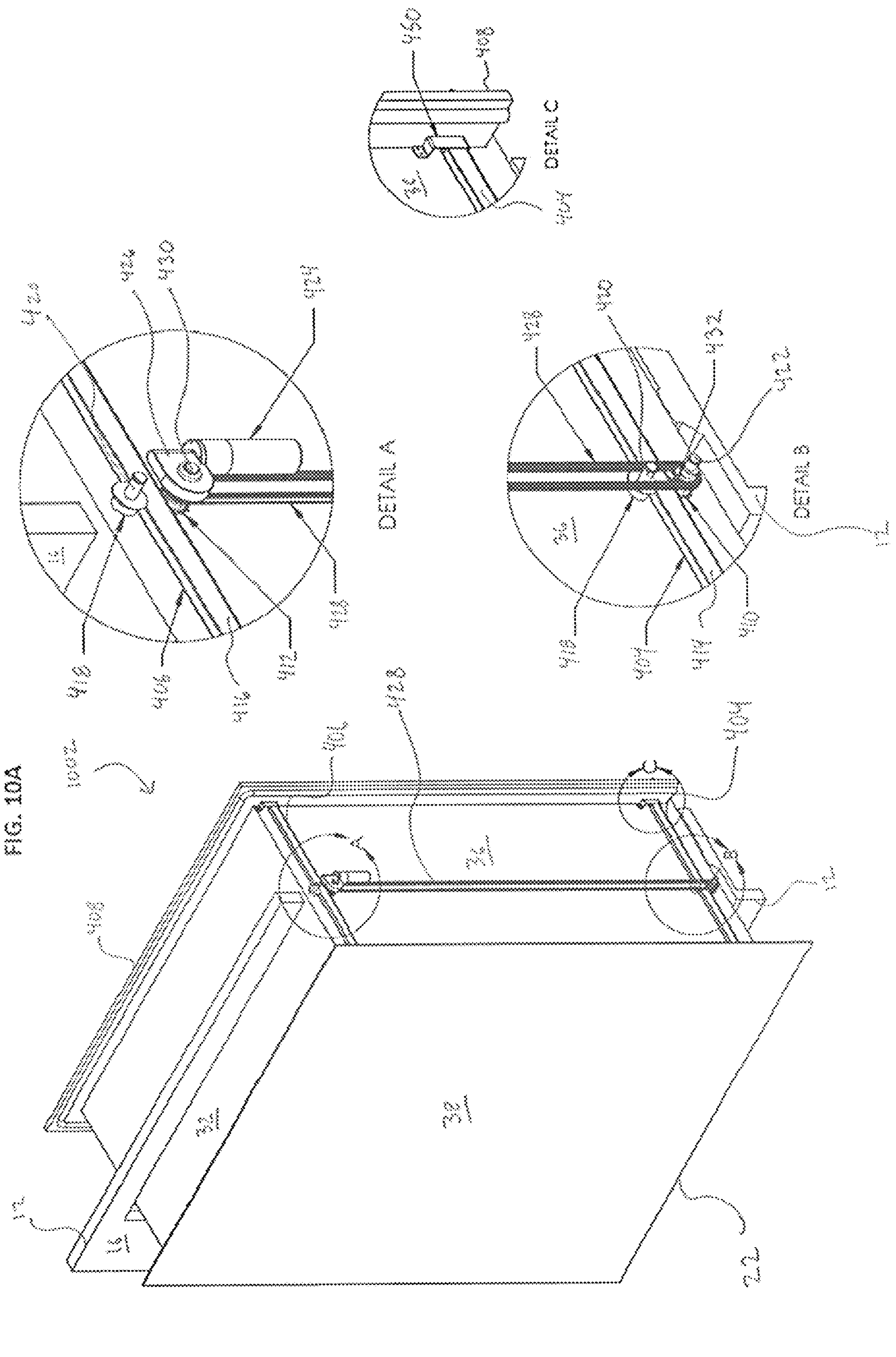


FIG. 10A

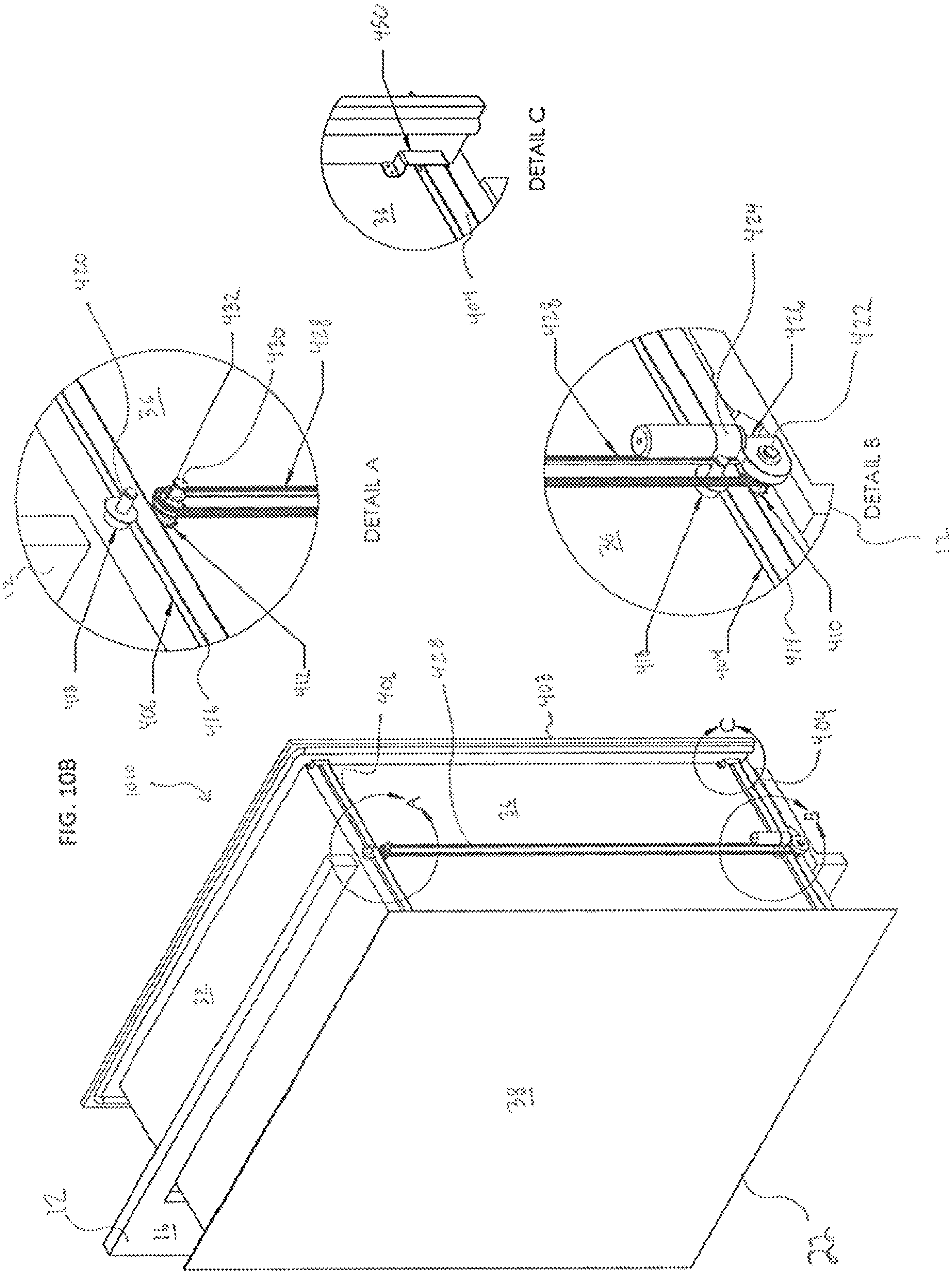


FIG. 10B

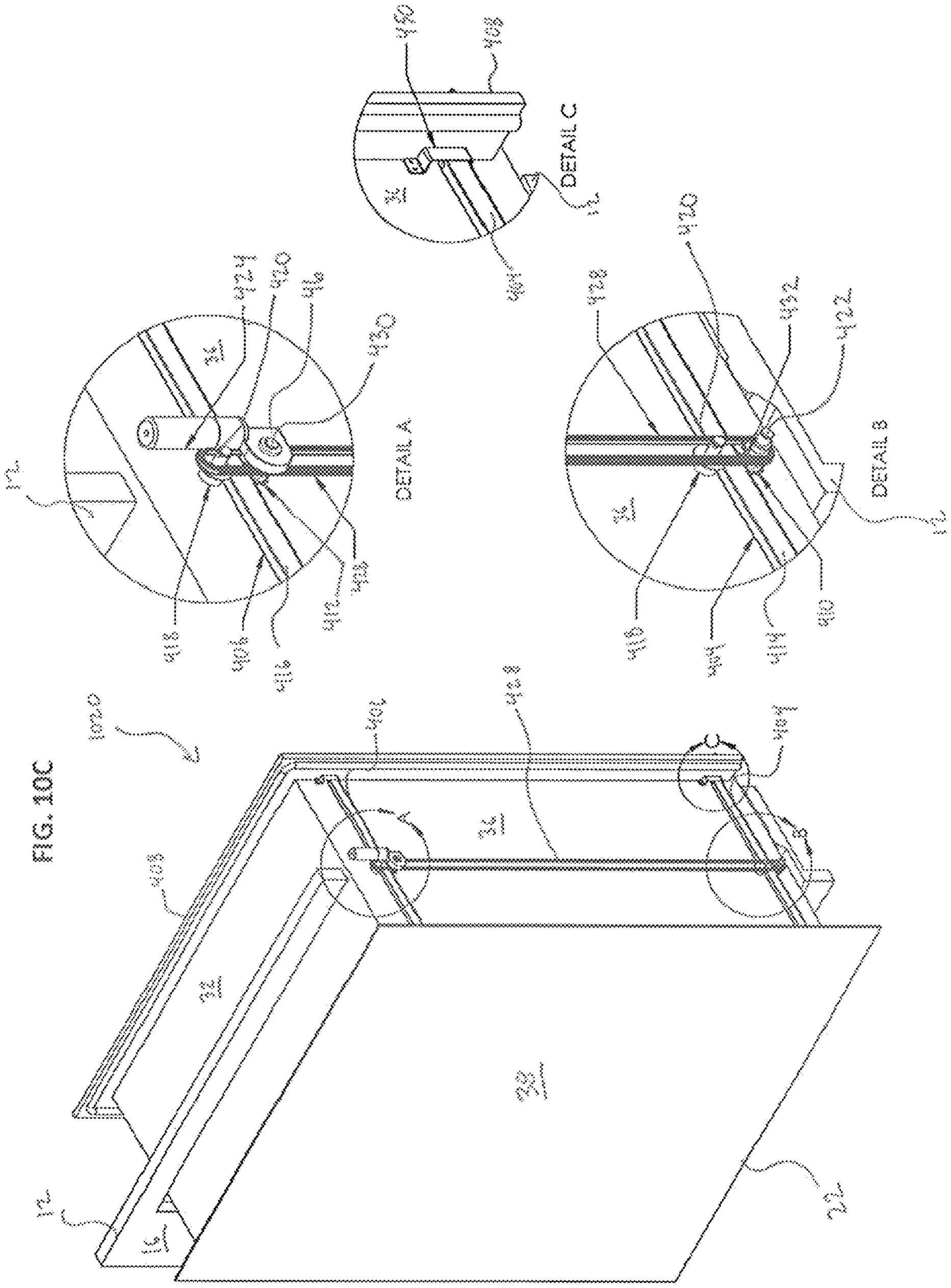


FIG. 10C

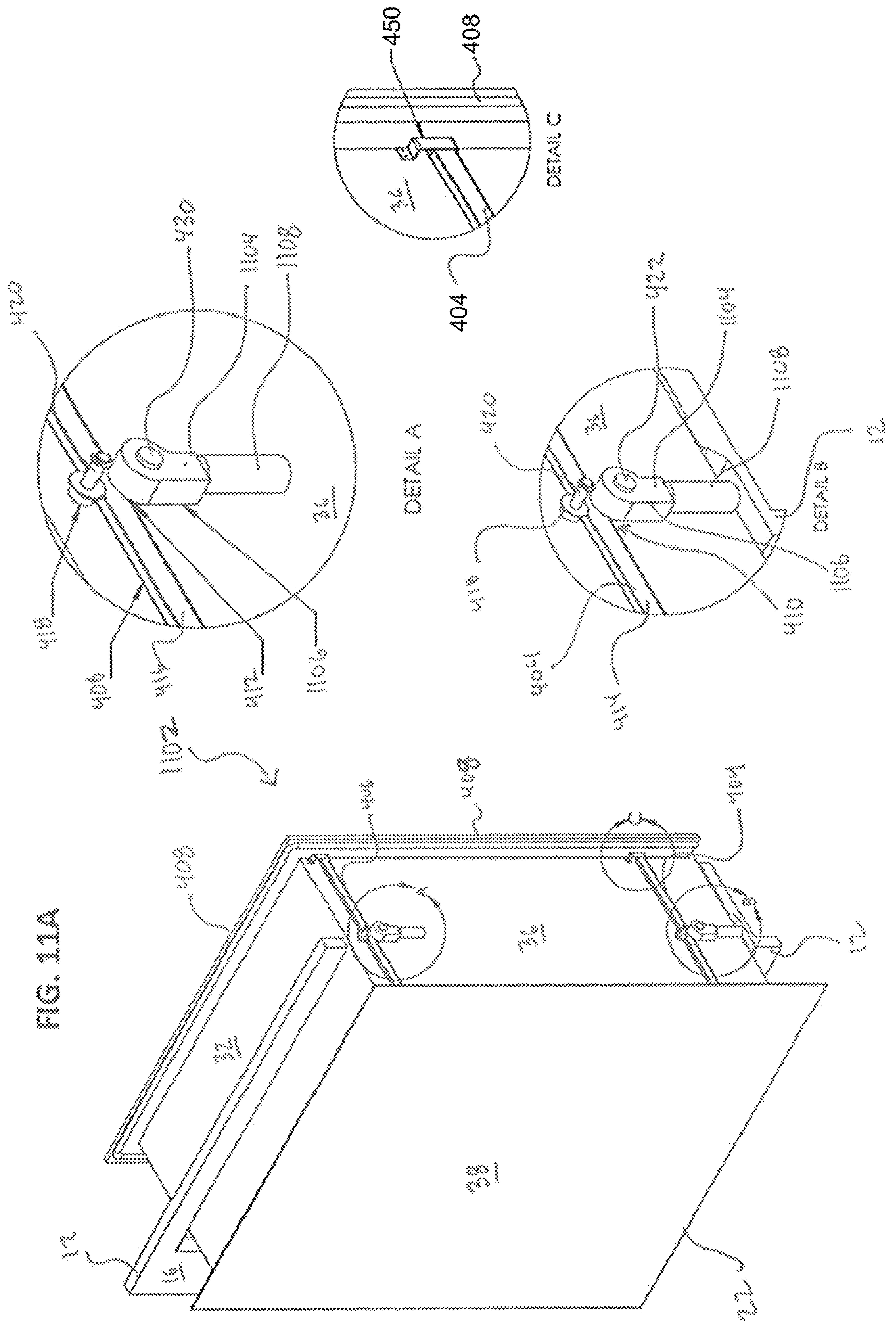


FIG. 11A

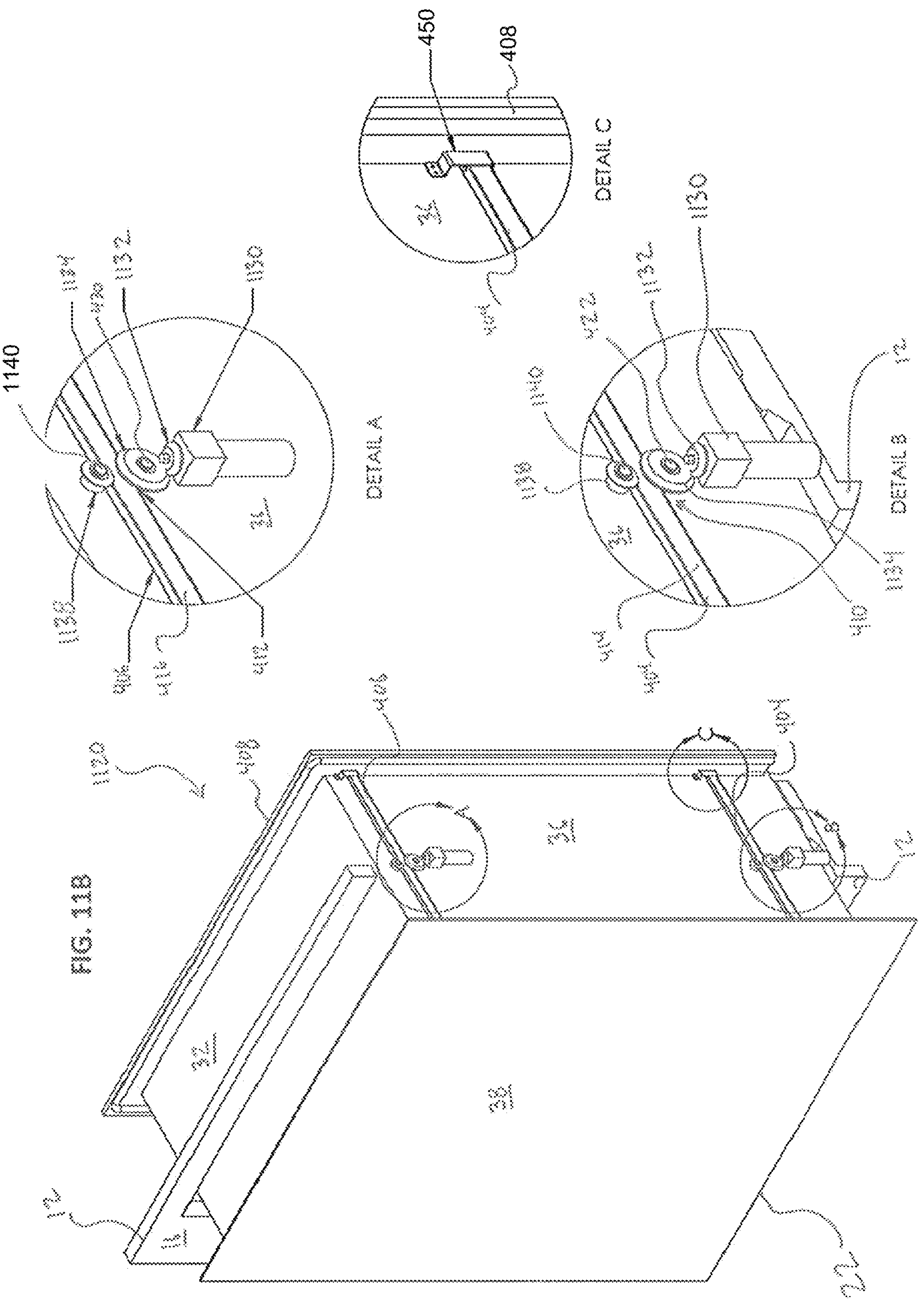


FIG. 11B

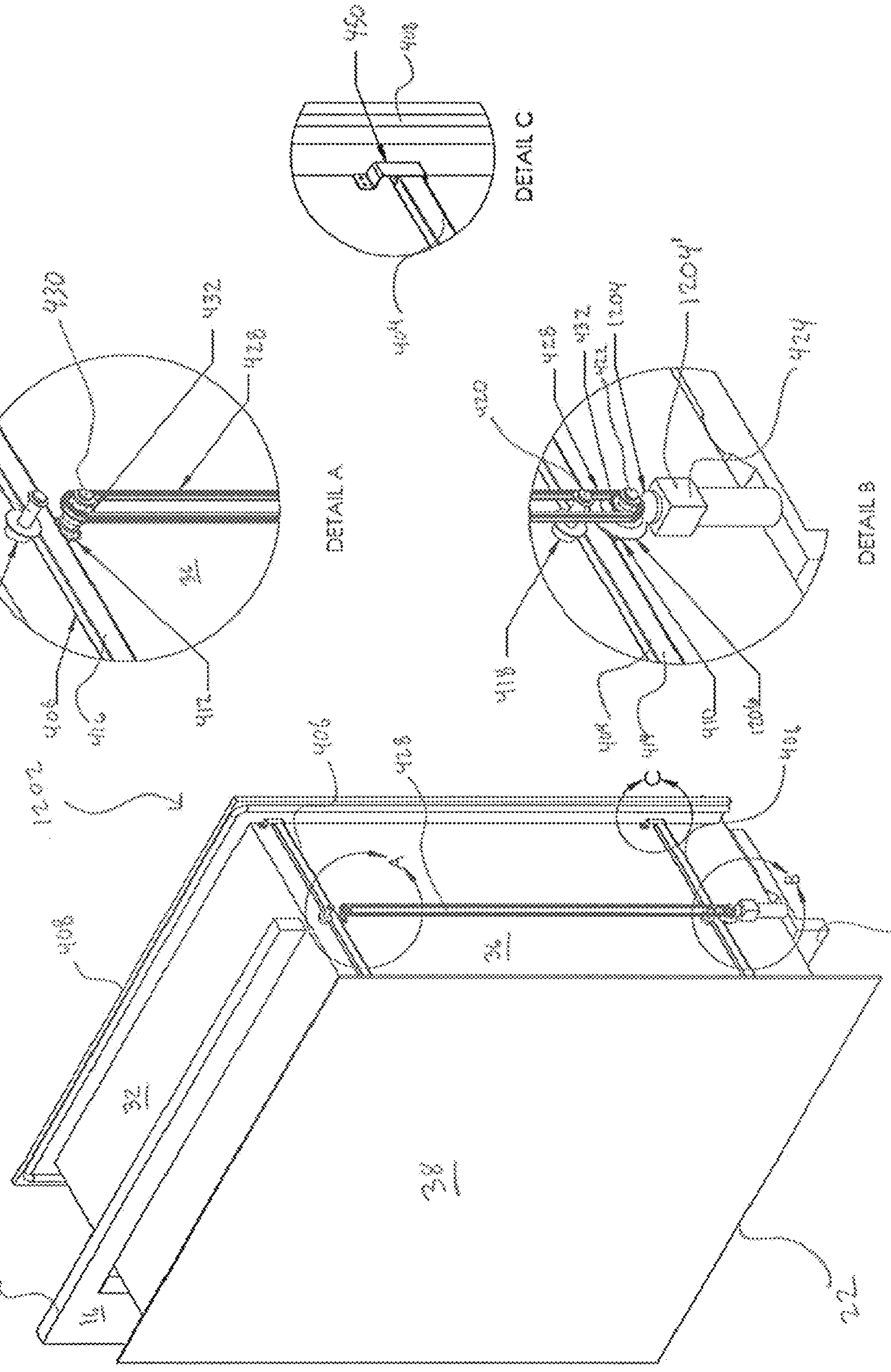
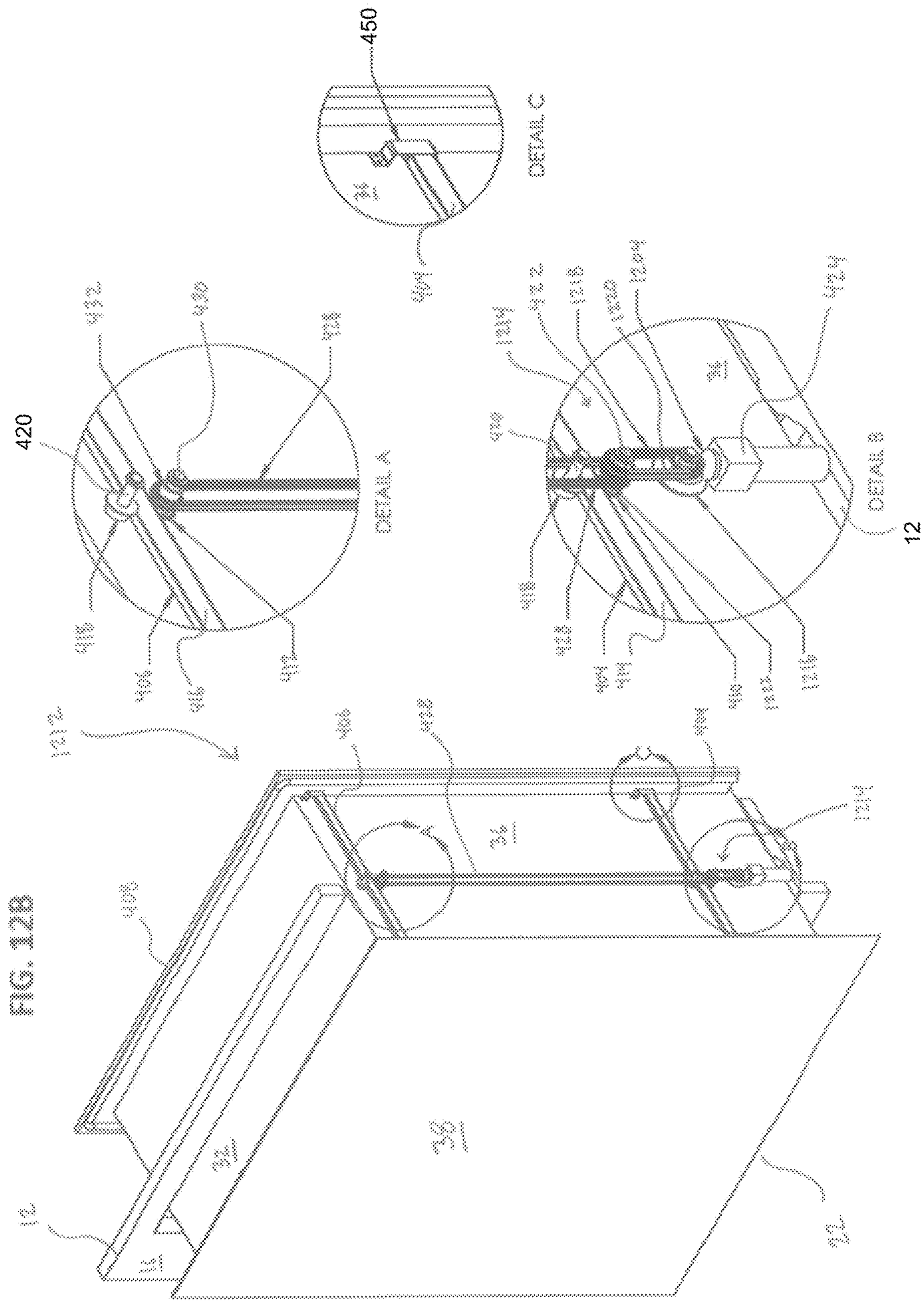


FIG. 12A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DETAIL C
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DETAIL A
DETAIL B
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FIG. 12B

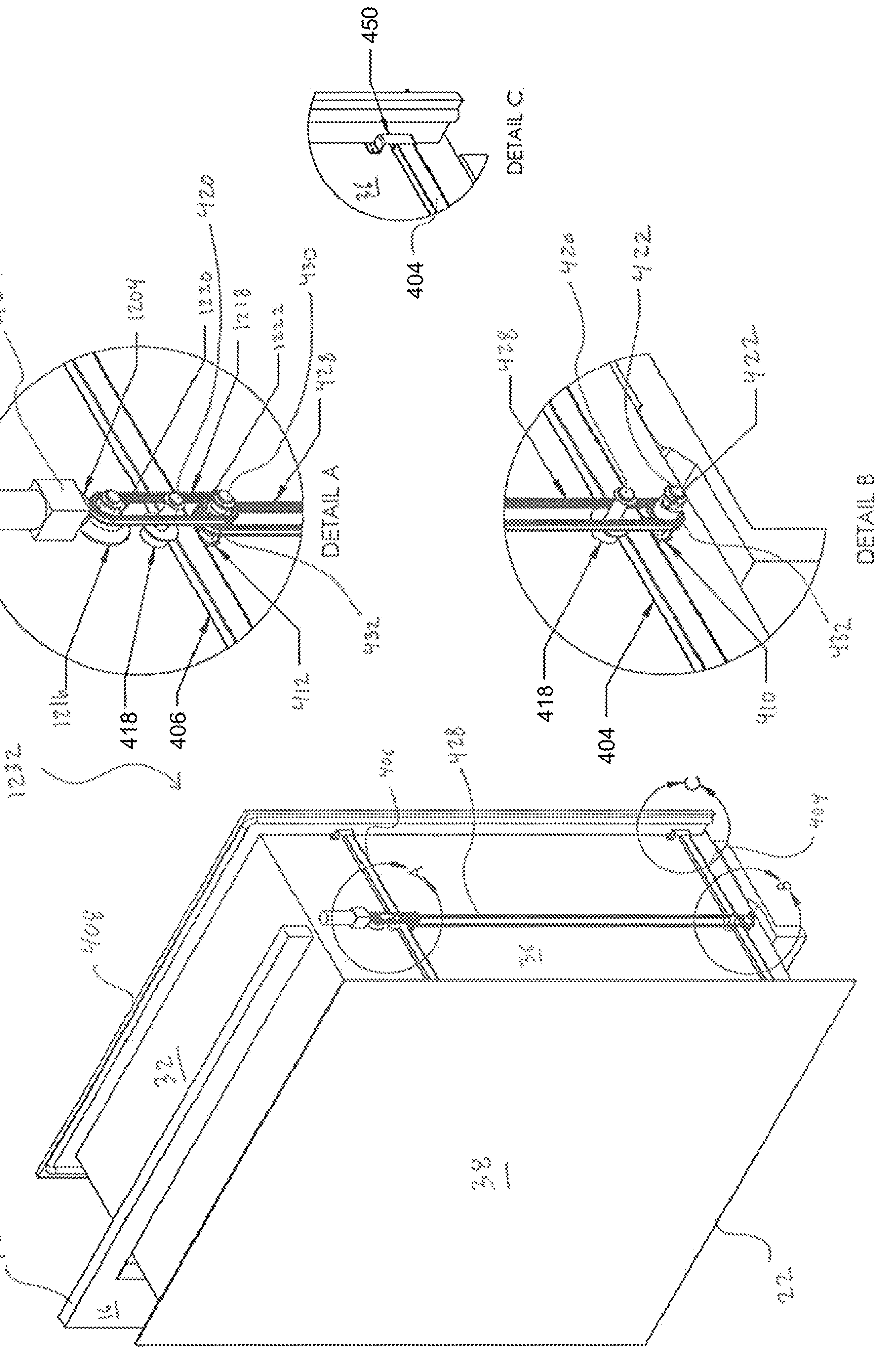


FIG. 12C

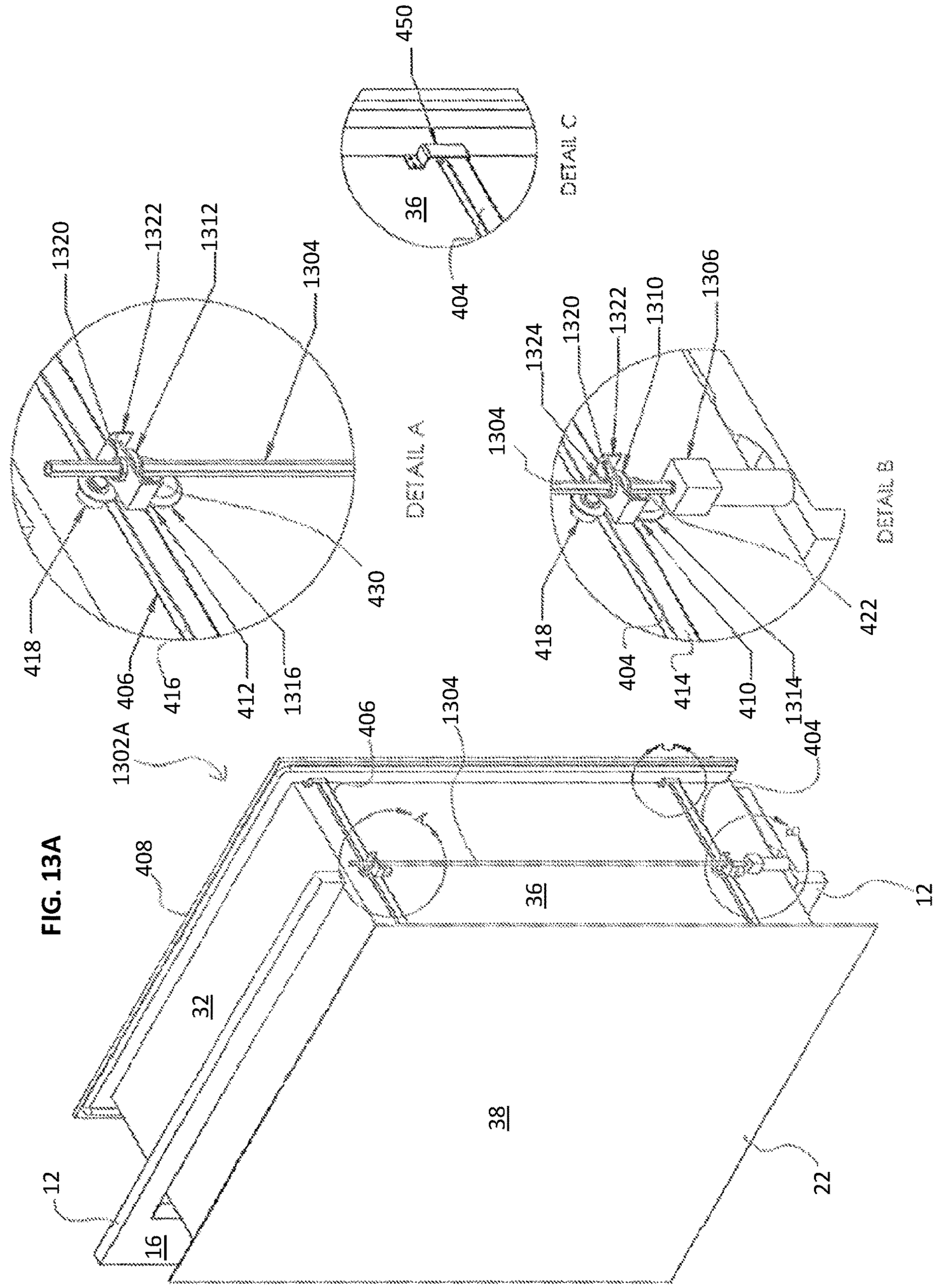

450
DETAIL C
36
1320
1322
1312
1304
1302A
406
416
412
1316
418
430
DETAIL A
404
1324
1320
1322
1310
1306
1304
418
404
414
410
1314
422
DETAIL B
406
1304
404
408
36
12
32
38
16
22

FIG. 13A

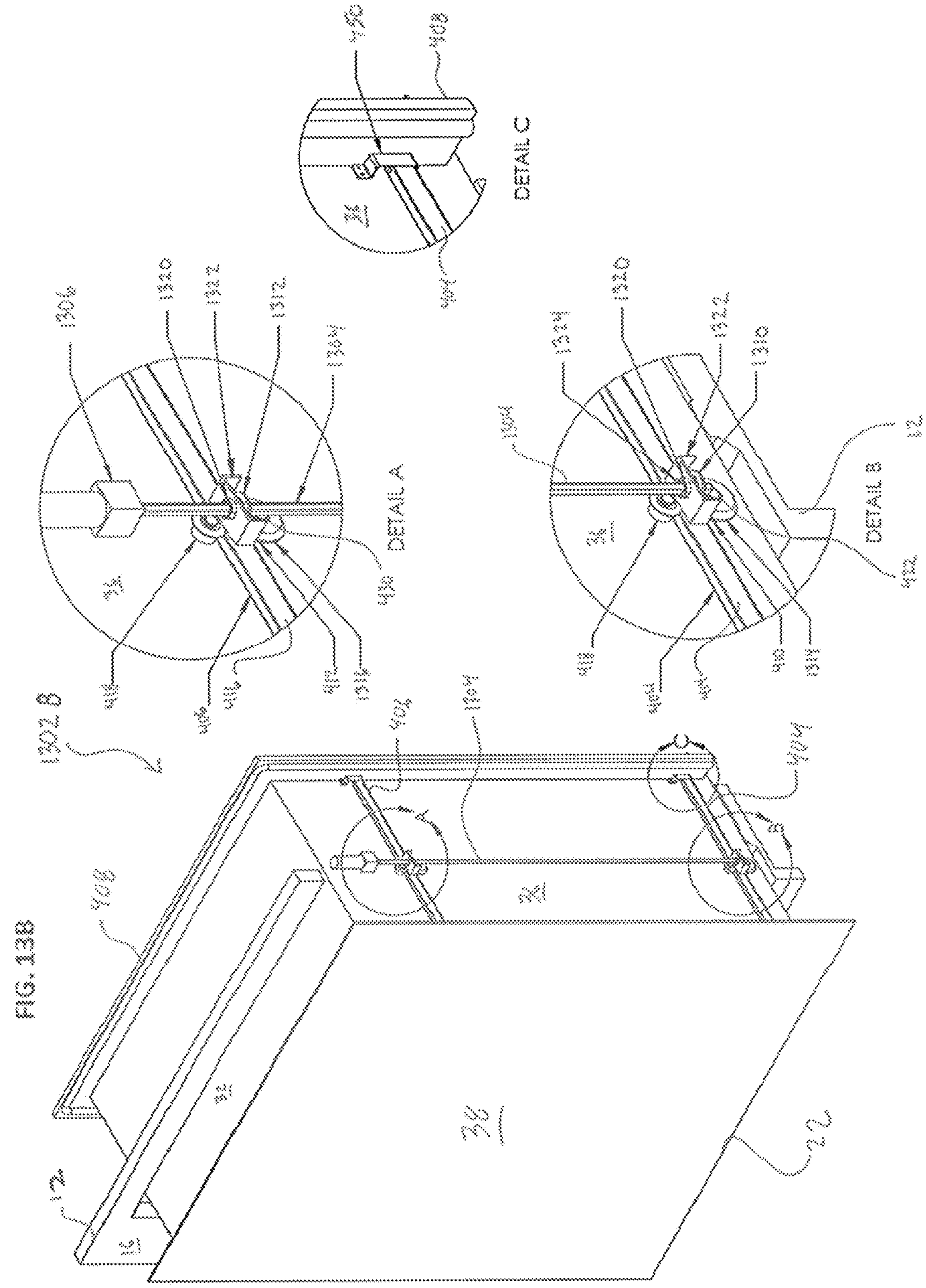

1302B
1304
1306
1308
1310
1312
1314
1316
1318
1320
1322
1324
1326
1328
1330
1332
1334
1336
1338
1340
1342
1344
DETAIL A
DETAIL B
DETAIL C
12
21
22
31
32

FIG. 13B

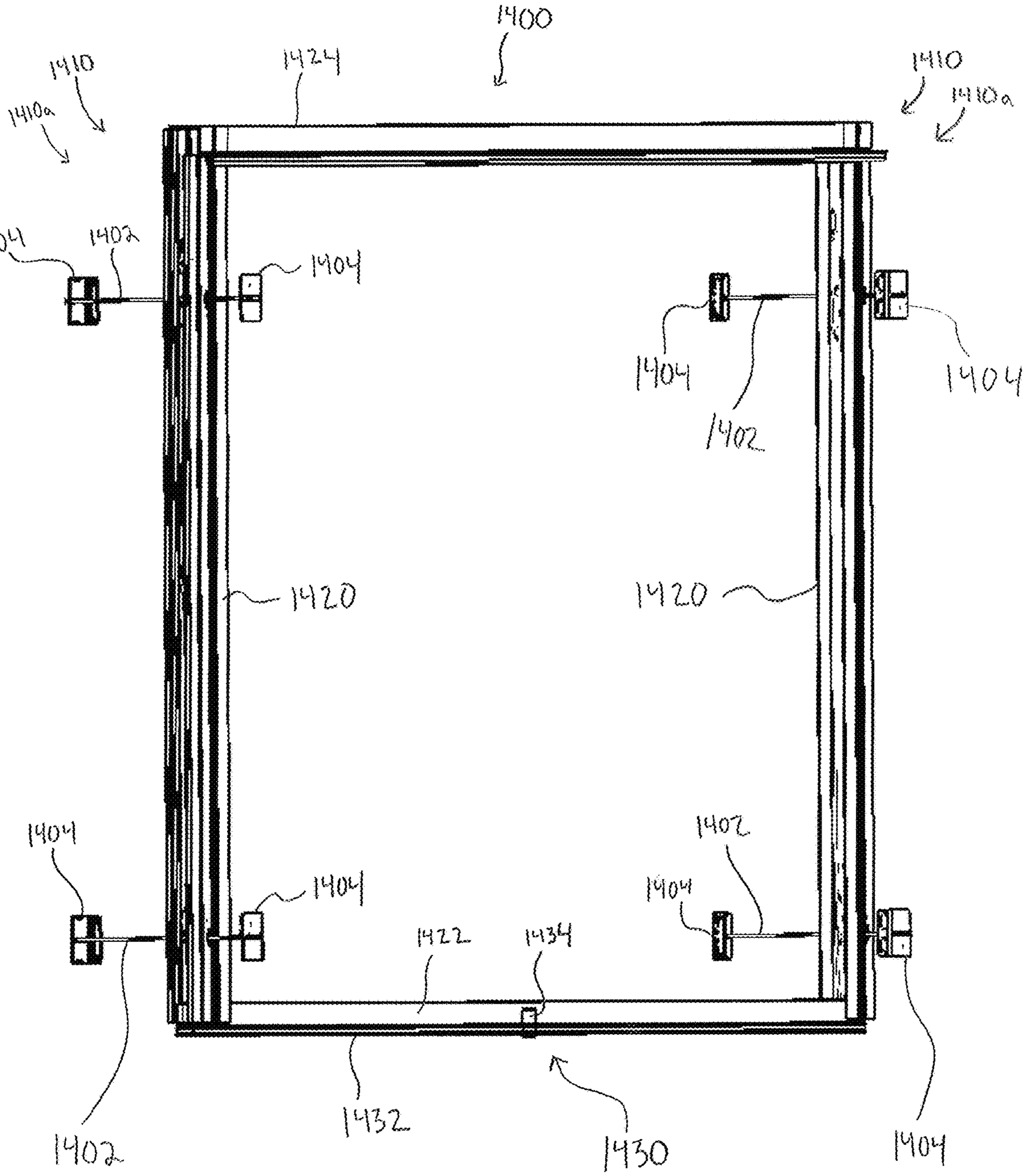

1400
1410
1410a
1424
1410
1410a
1404
1402
1404
1420
1404
1402
1420
1404
1404
1422
1434
1432
1430
1402
1404

FIG. 14

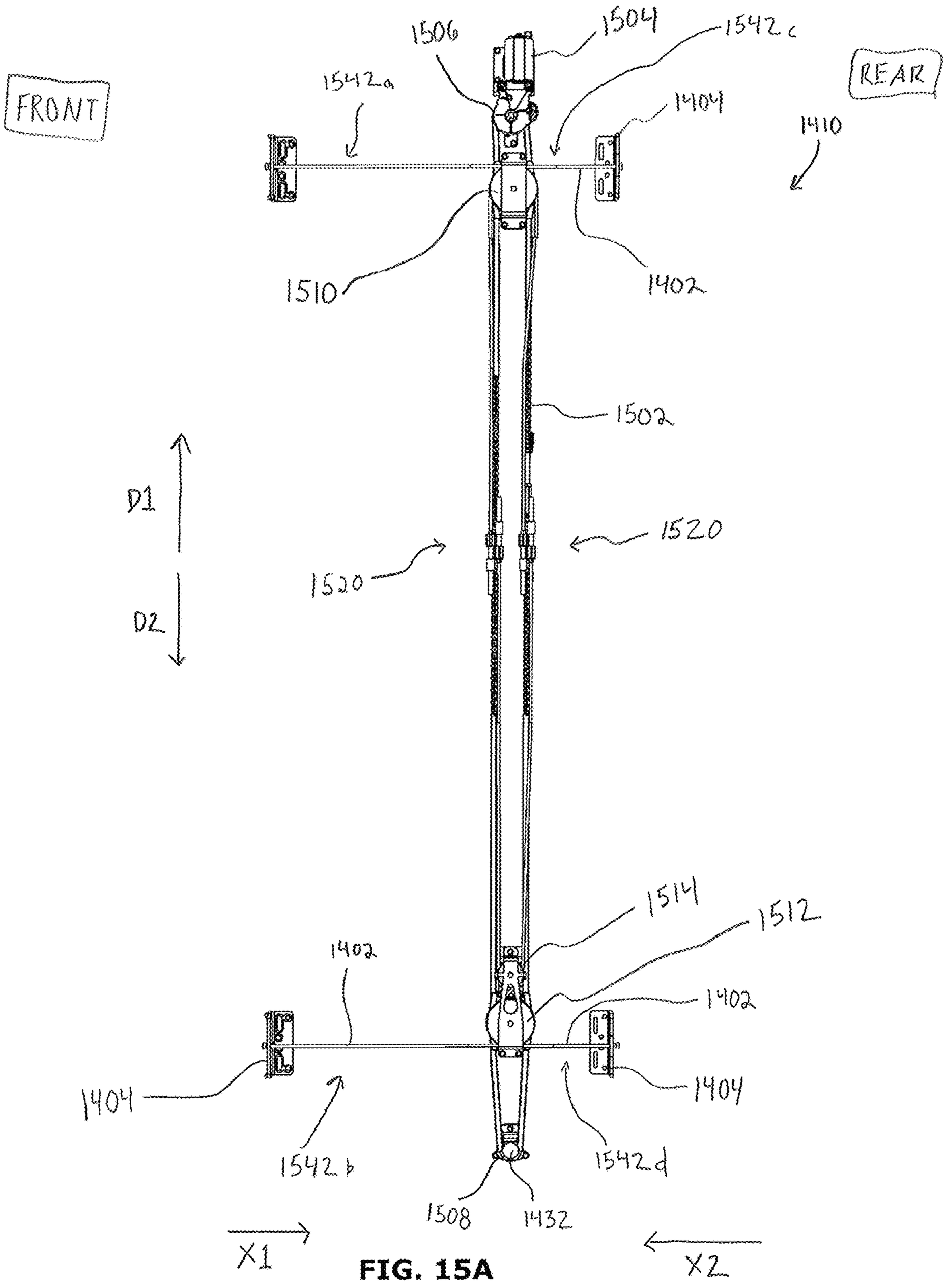

FRONT
REAR
1506
1504
1542c
1542a
1404
1410
1510
1402
1502
D1
D2
1520
1520
1514
1512
1402
1404
1404
1542b
1542d
1508
1432
X1
X2

FIG. 15A

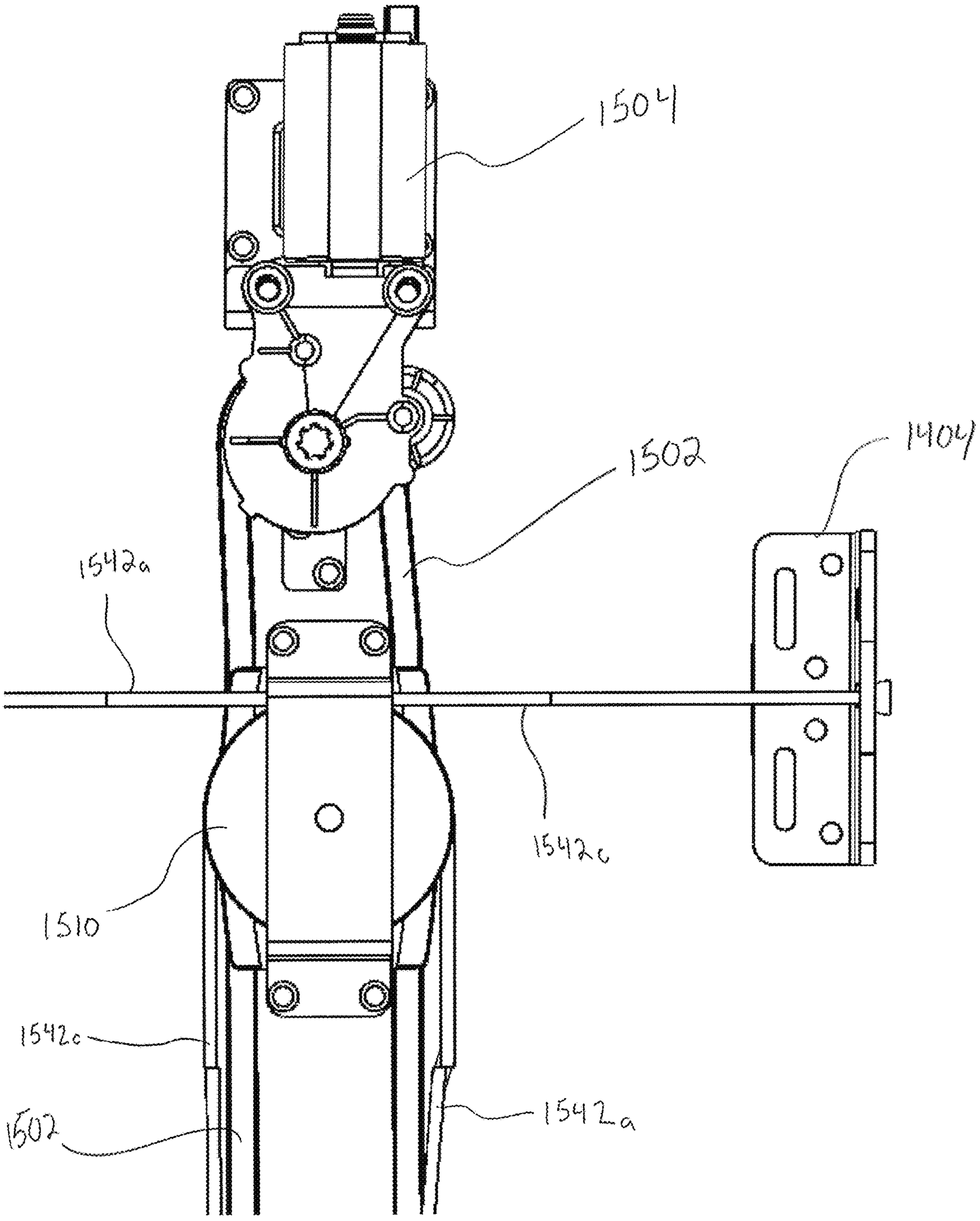


FIG. 15B

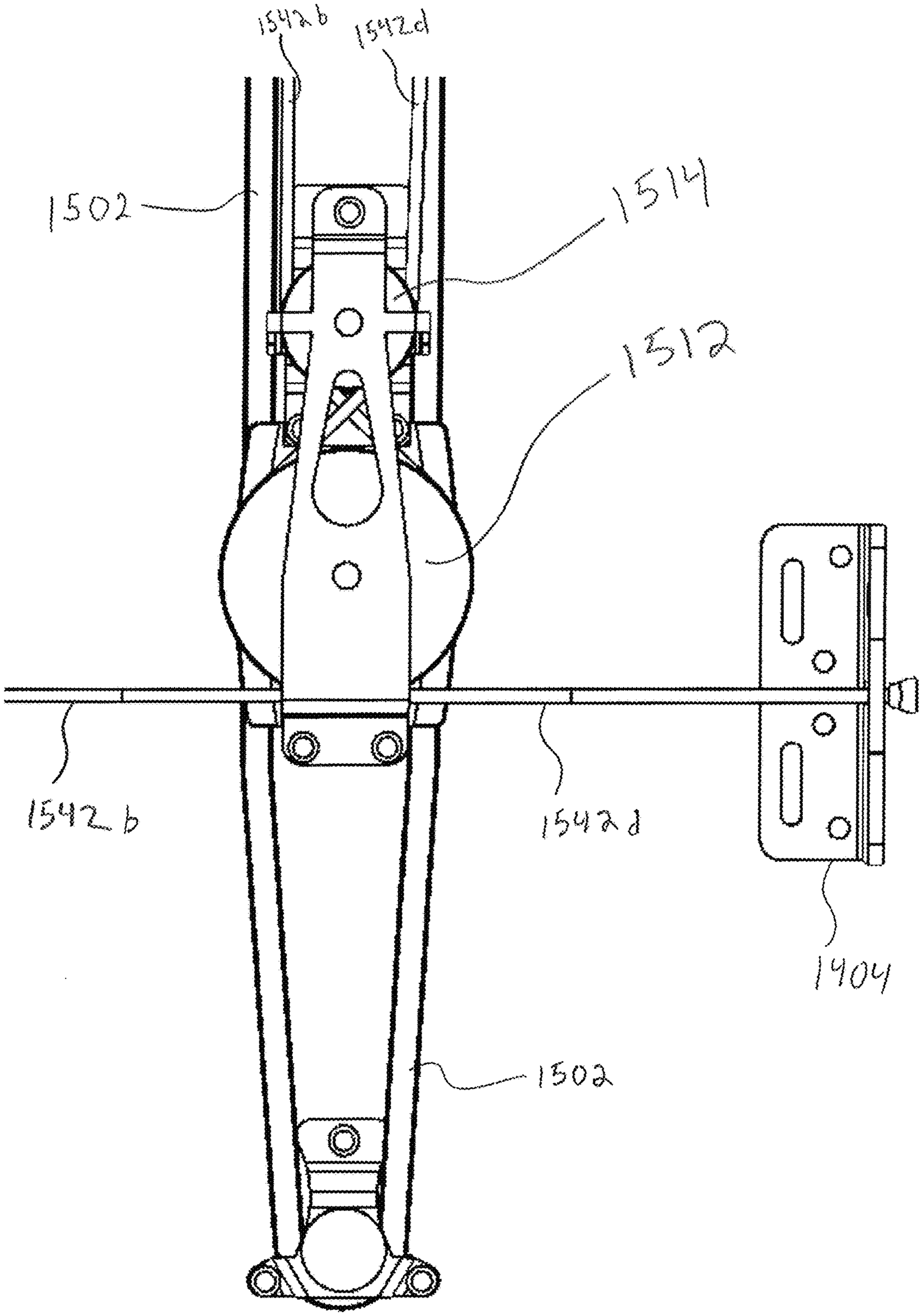


FIG. 15C

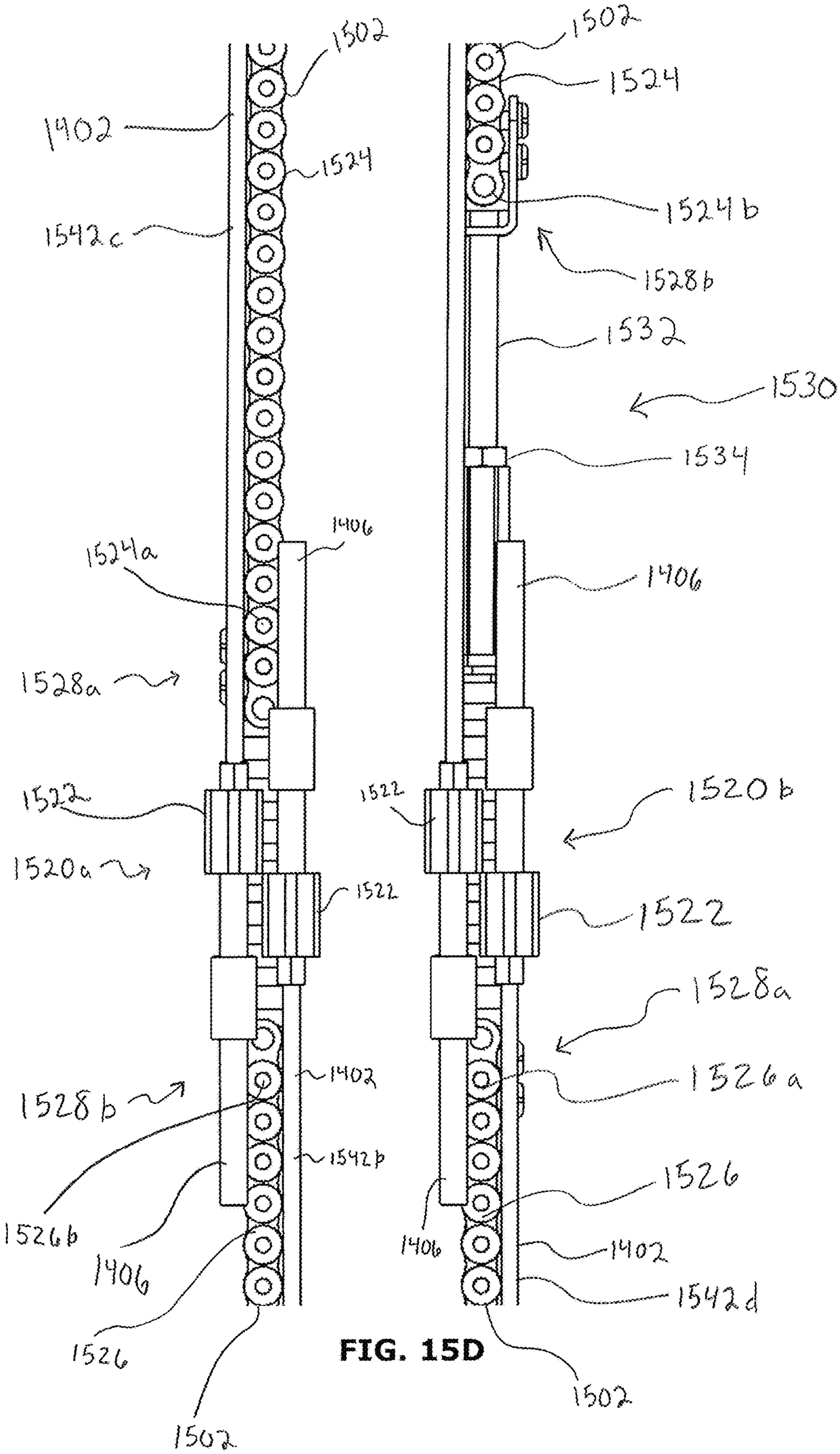

1502
1902
1524
1542c
1406
1524a
1528a
1522
1520a
1522
1528b
1402
1542b
1526b
1406
1526
1502
1502
1524
1524b
1528b
1532
1530
1534
1406
1520b
1522
1522
1528a
1526a
1526
1406
1402
1542d
1502

FIG. 15D

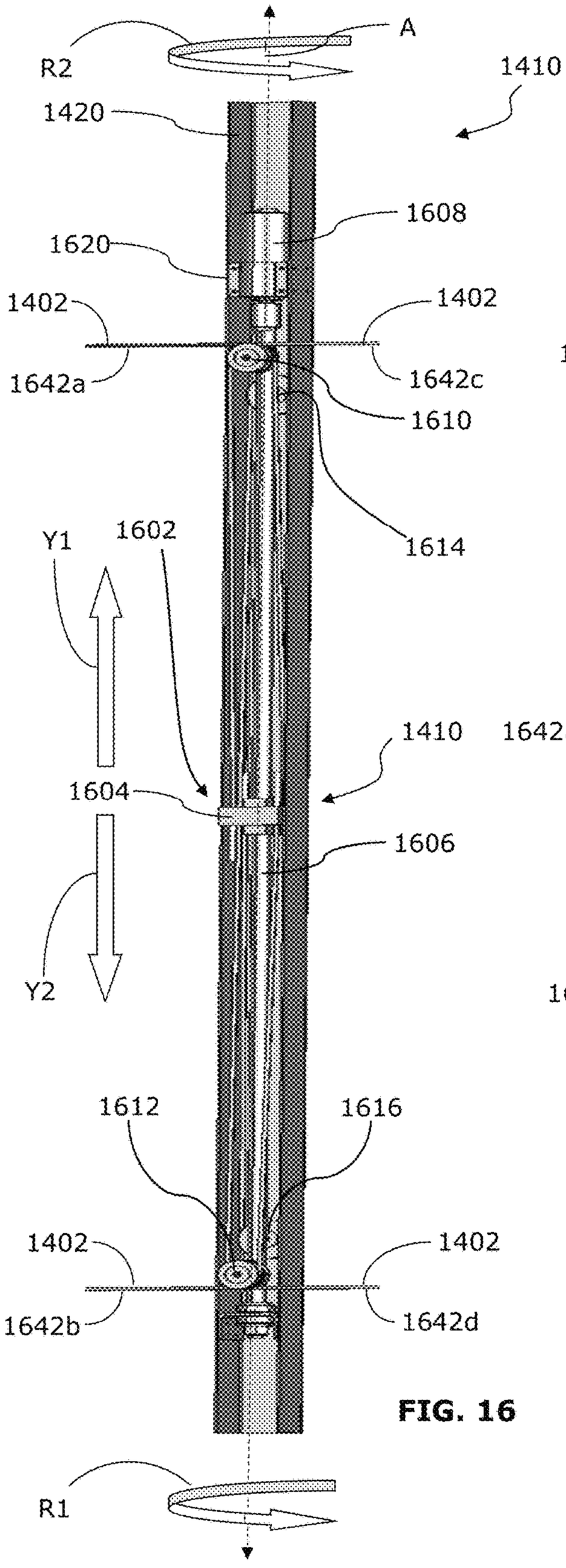


FIG. 16

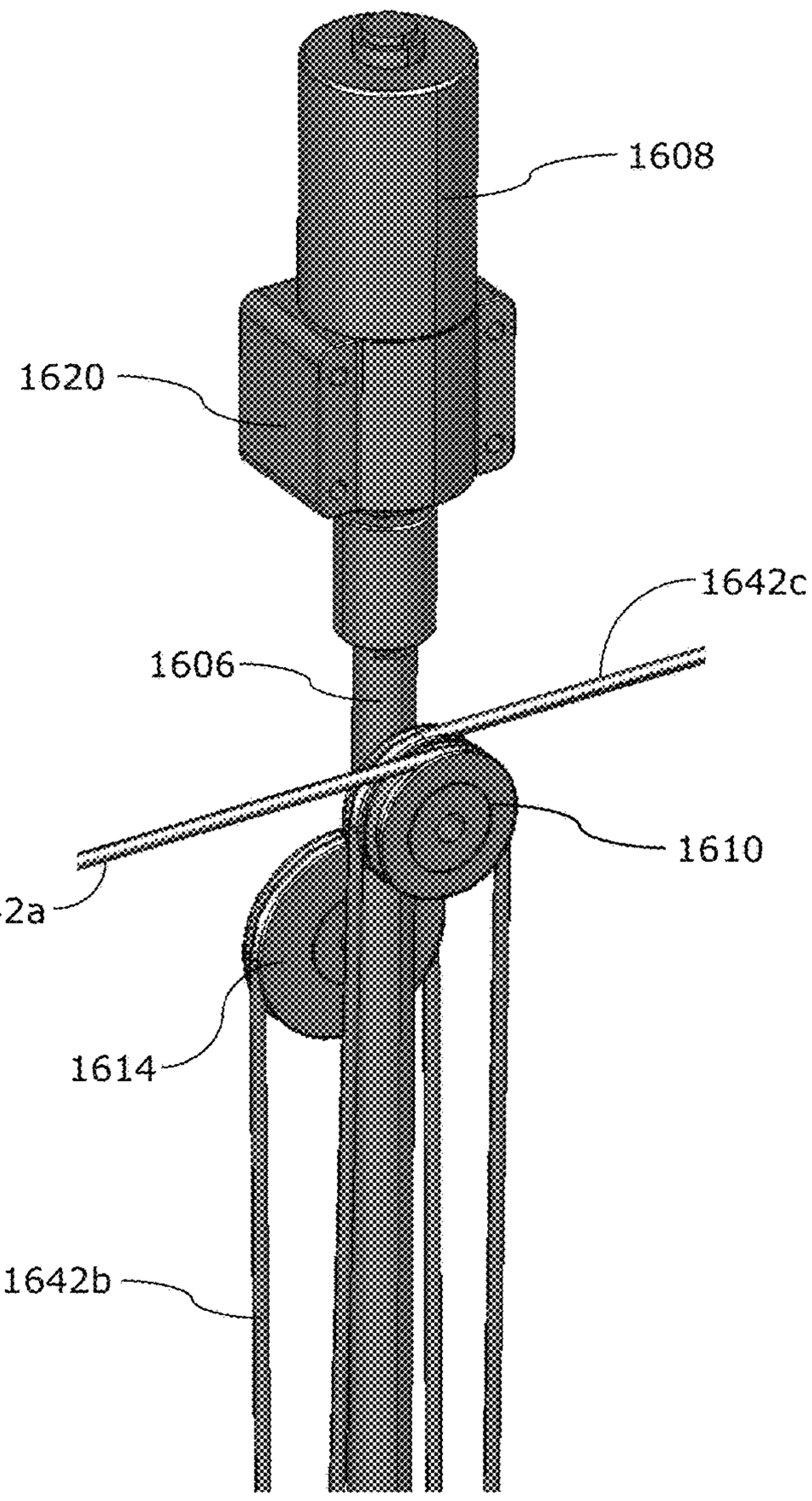


FIG. 17A

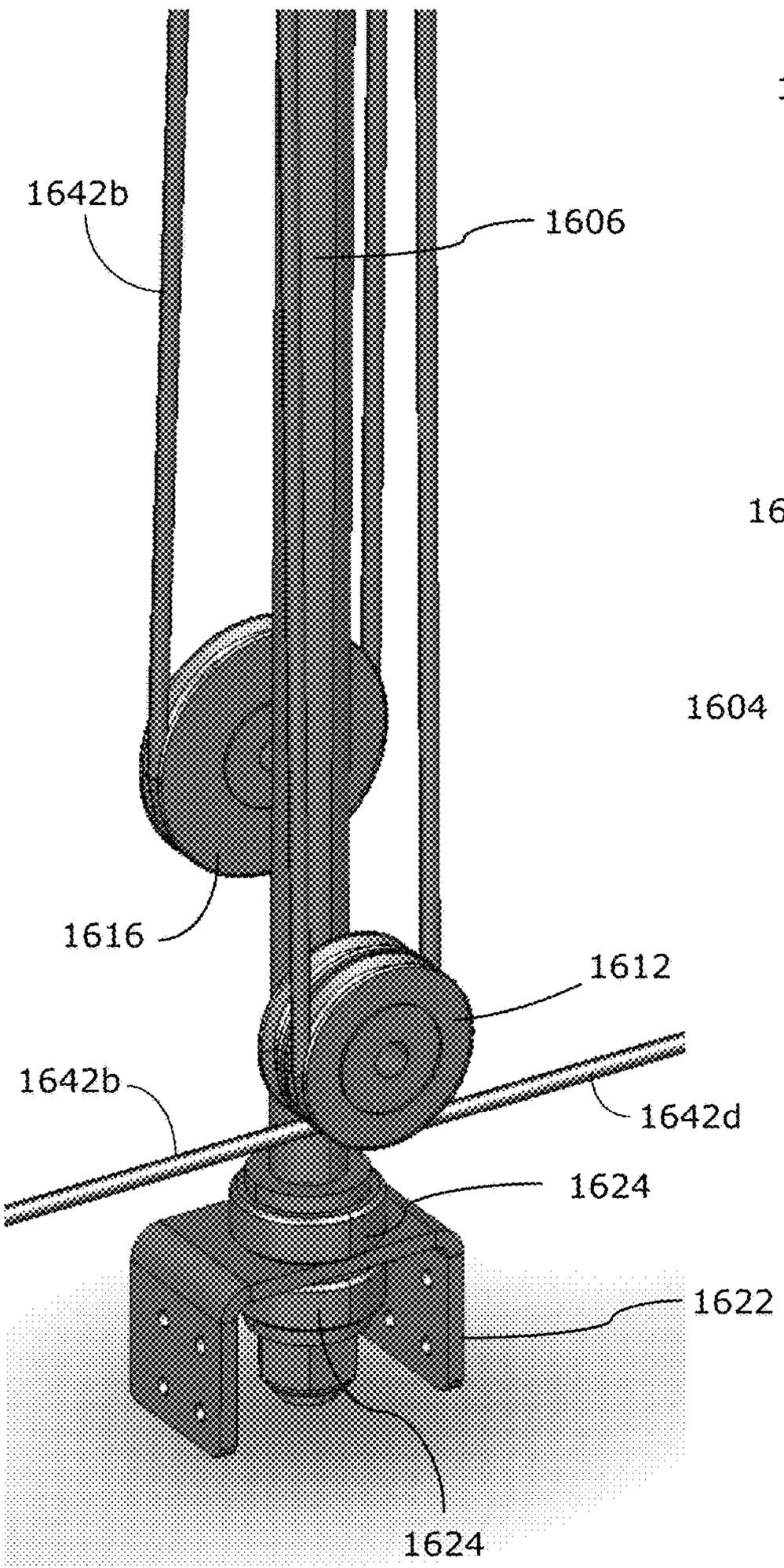


FIG. 17B

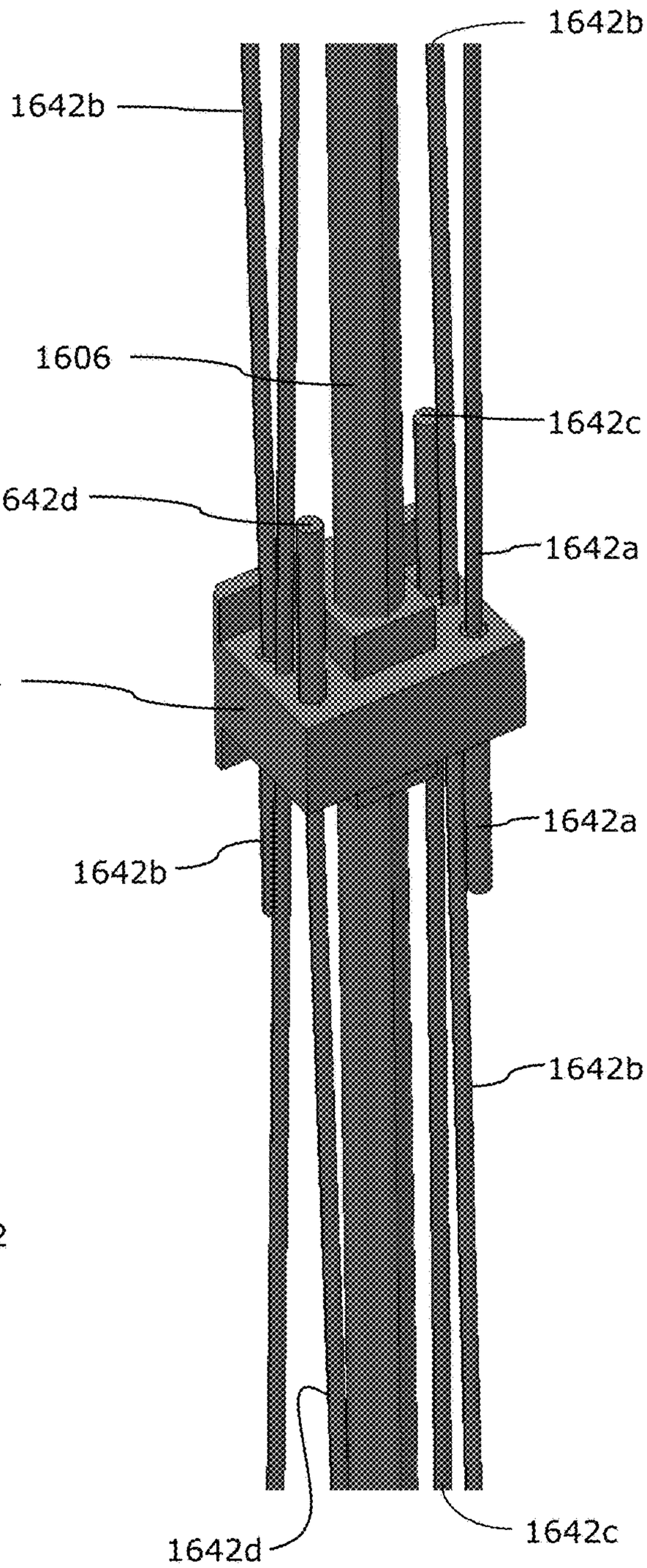


FIG. 17C

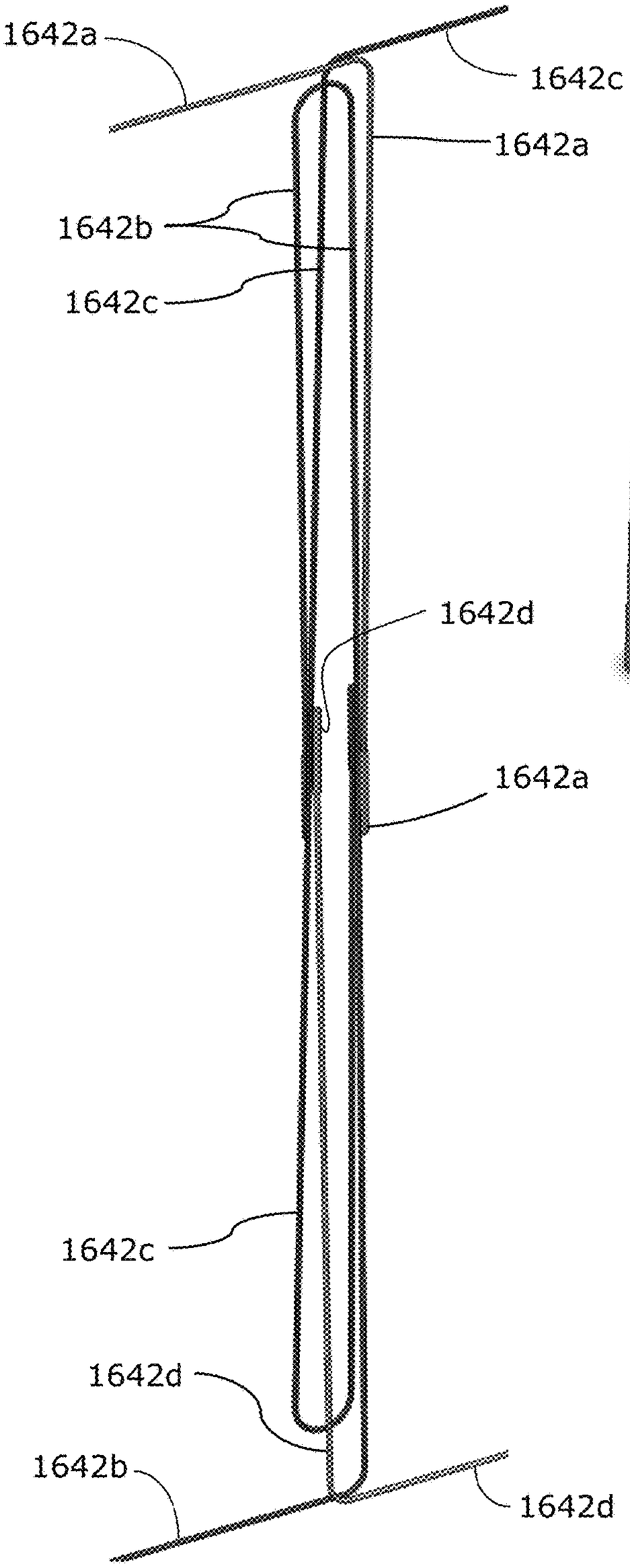


FIG. 18A

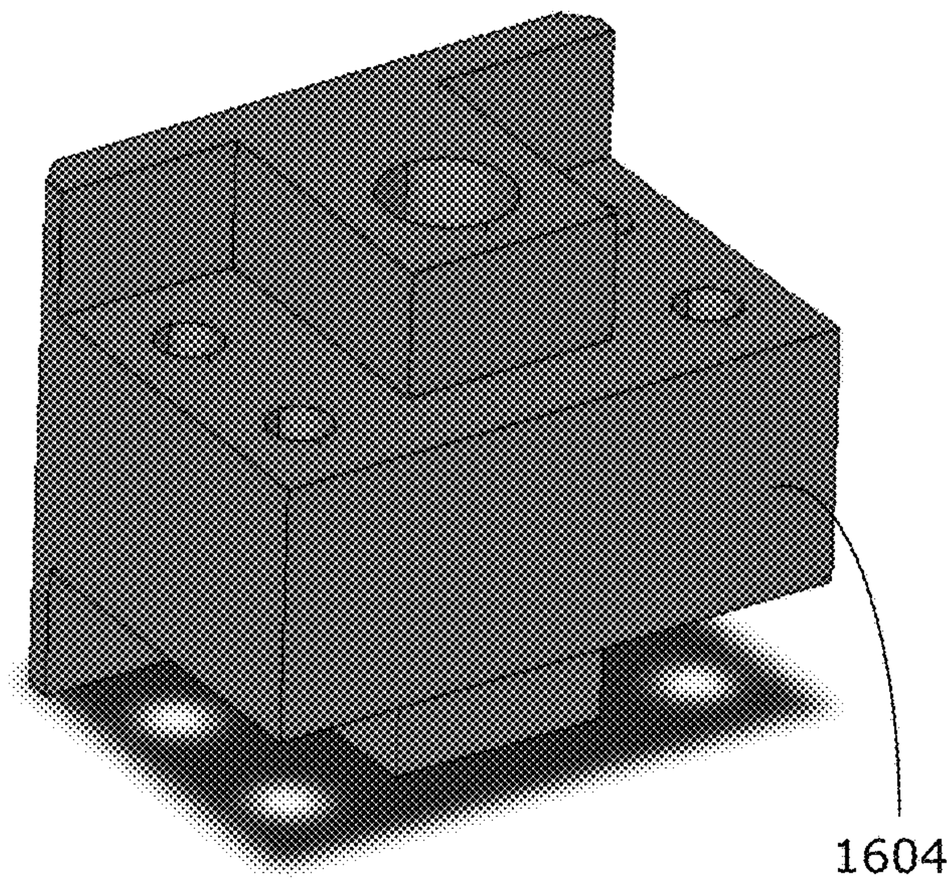


FIG. 18B

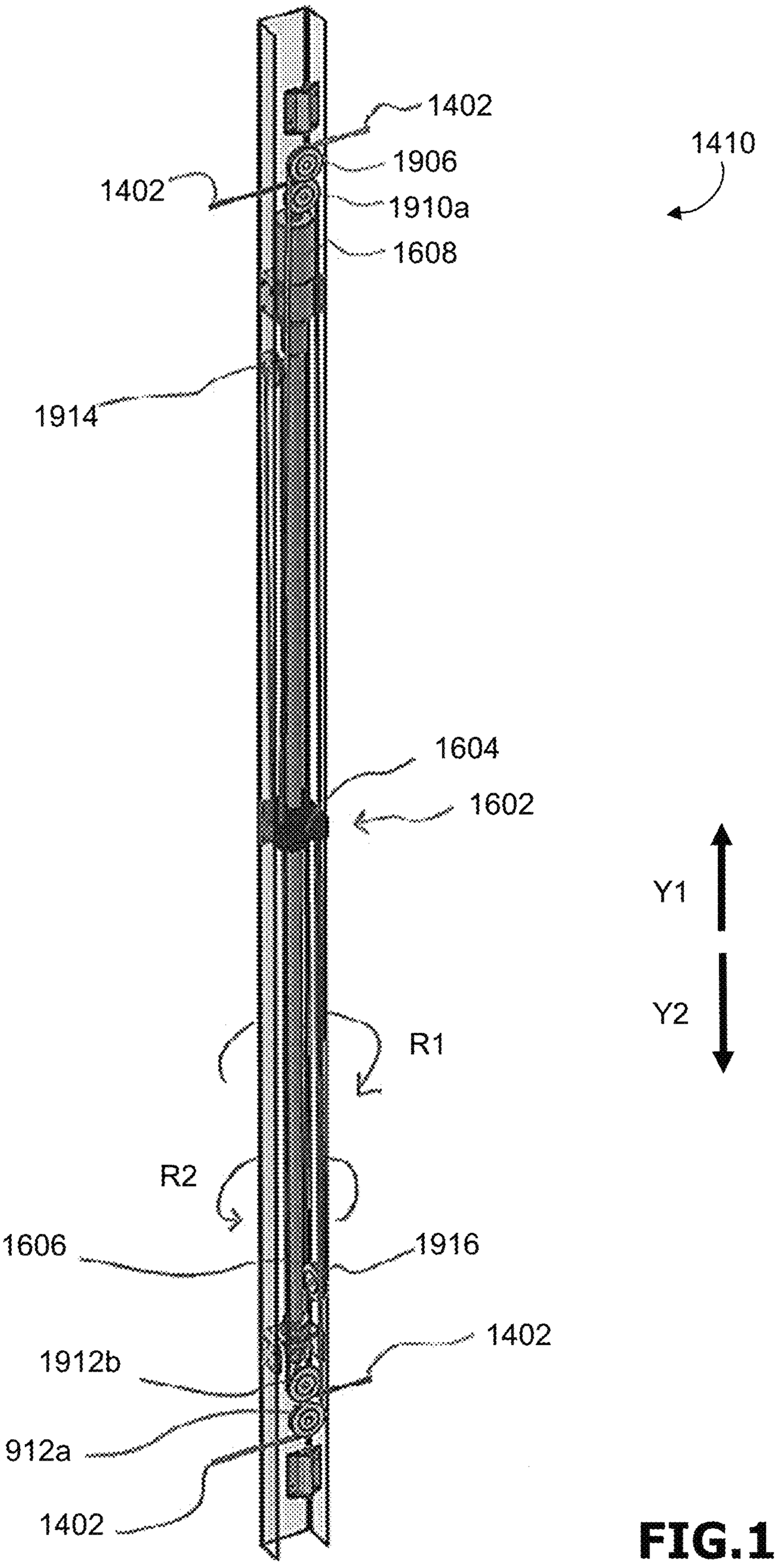

1402
1906
1402
1910a
1608
1914
1604
1602
1410
Y1
Y2
R1
R2
1606
1916
1912b
1402
1912a
1402

FIG.19

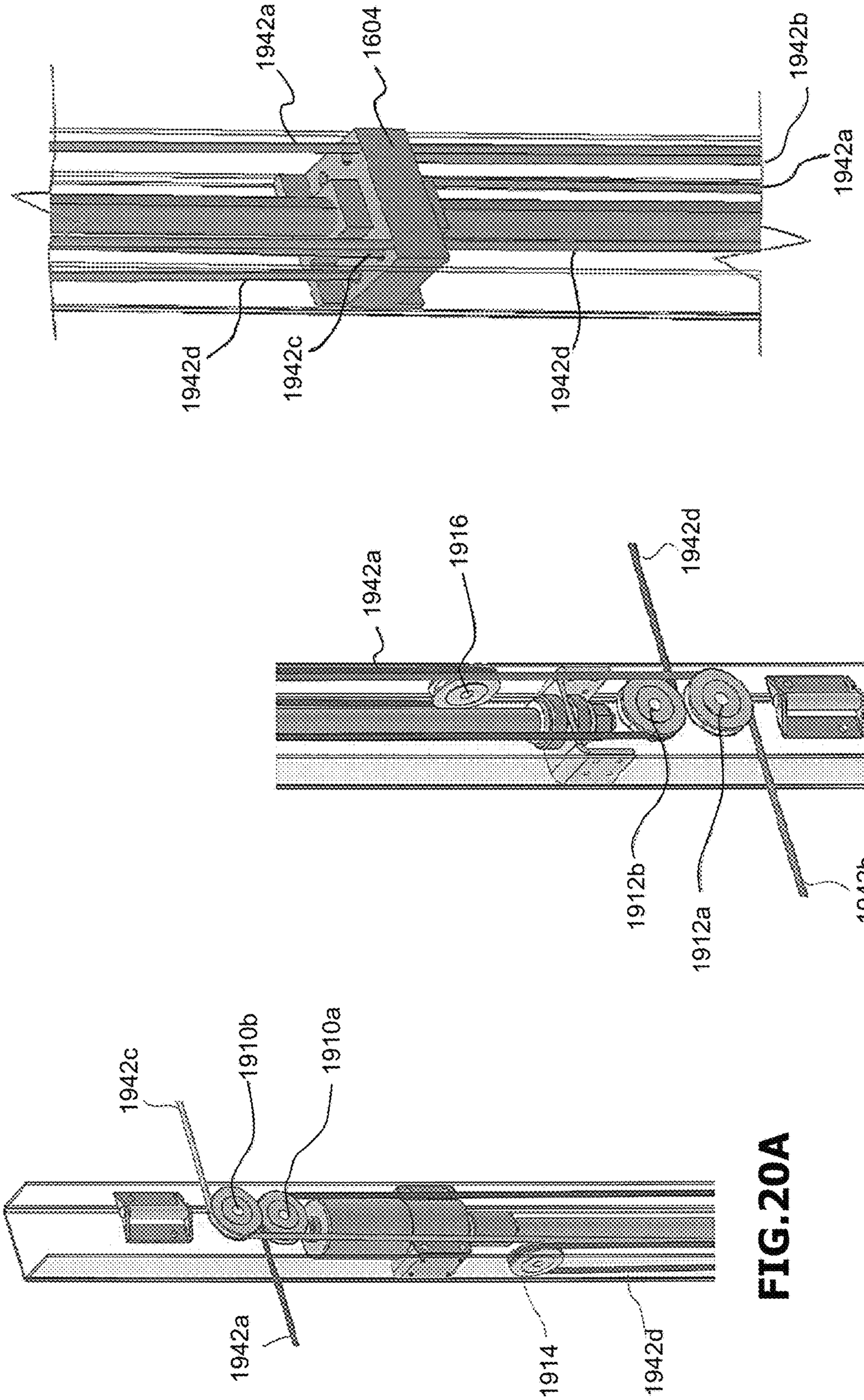


FIG.20C

FIG.20B

FIG.20A

FIG. 21A

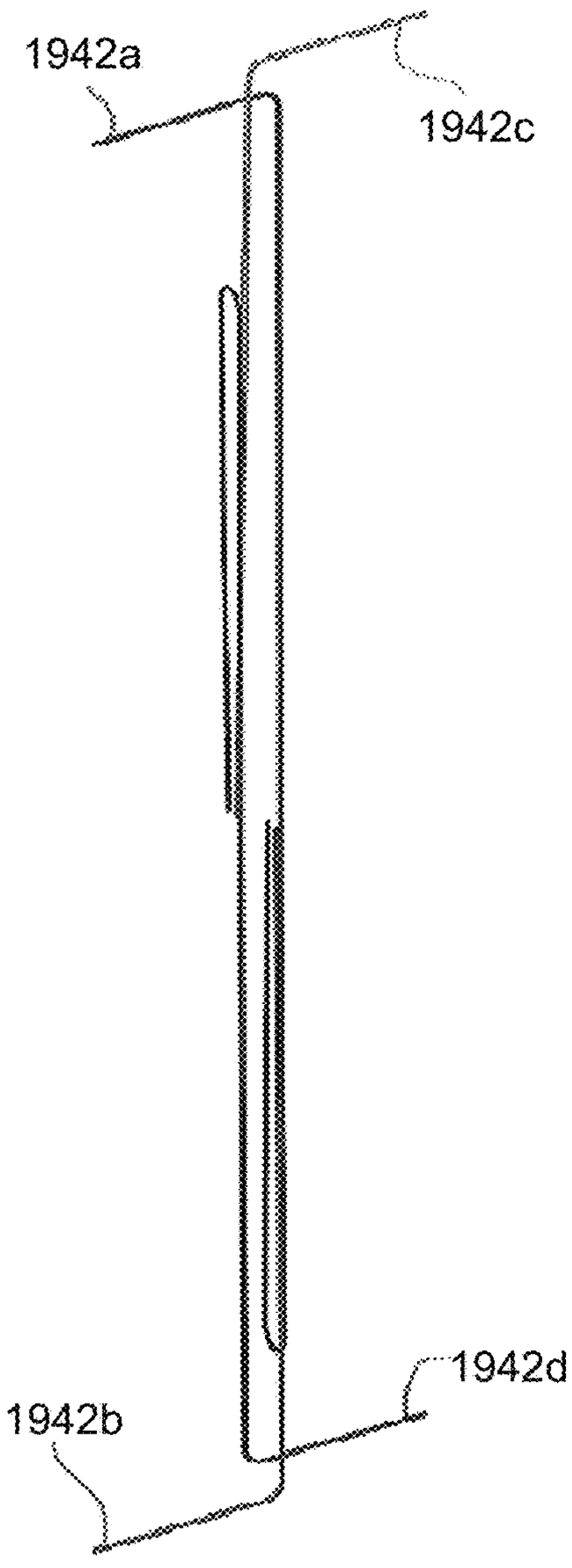
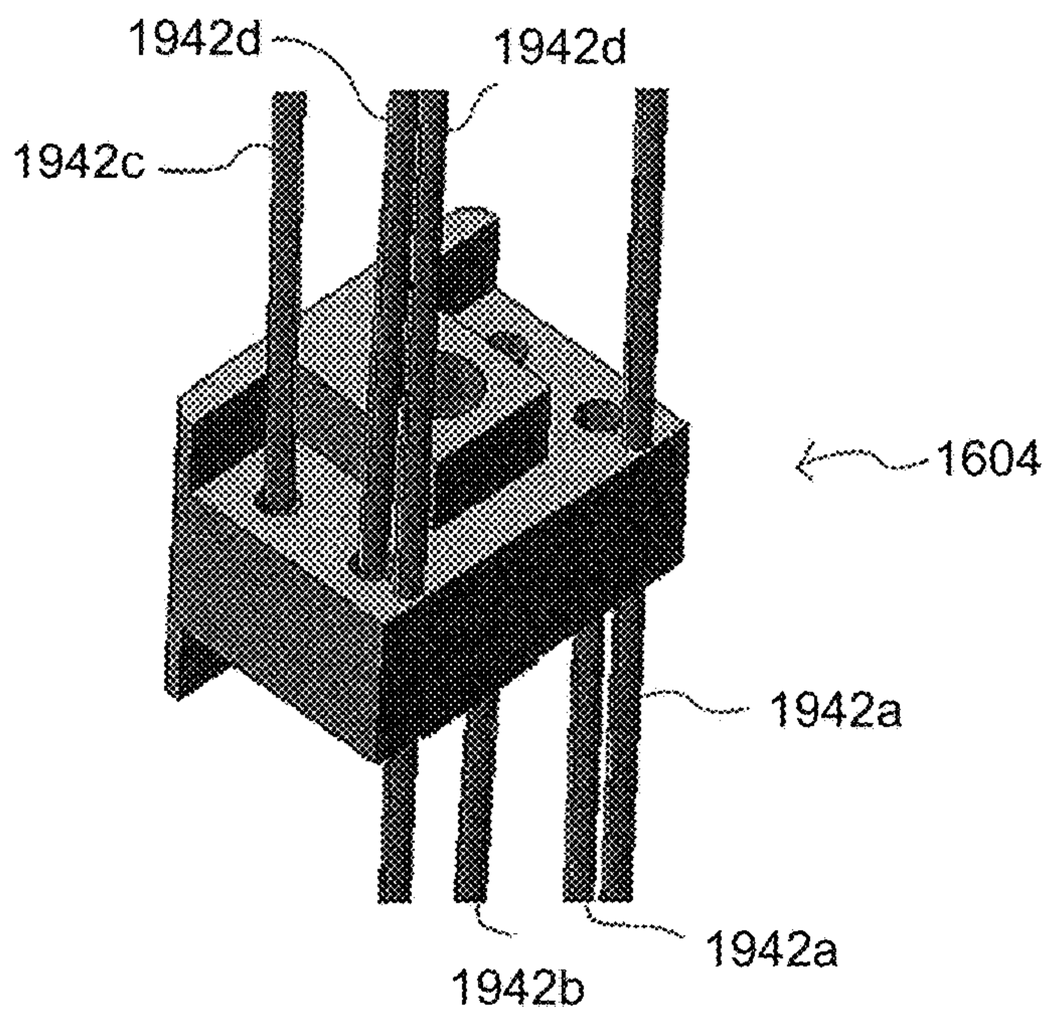


FIG. 21B



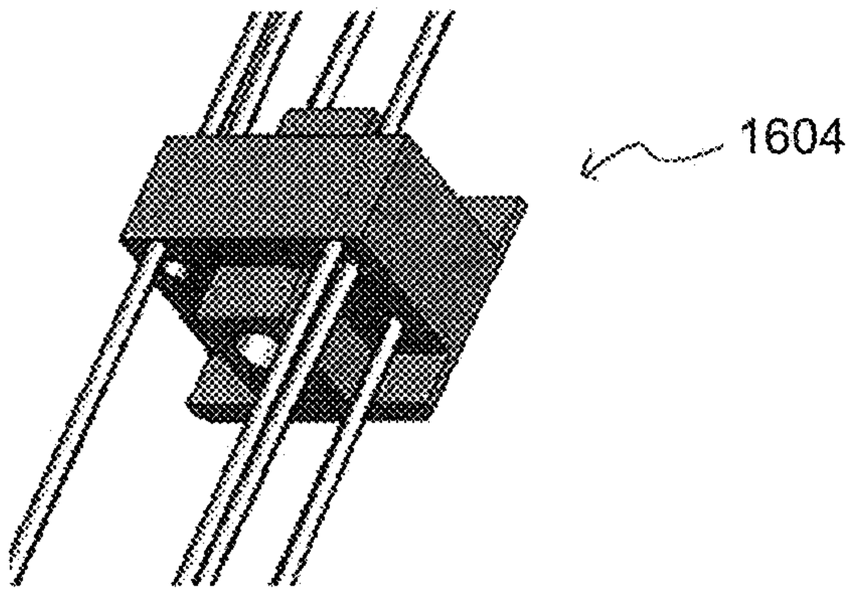


FIG. 21C

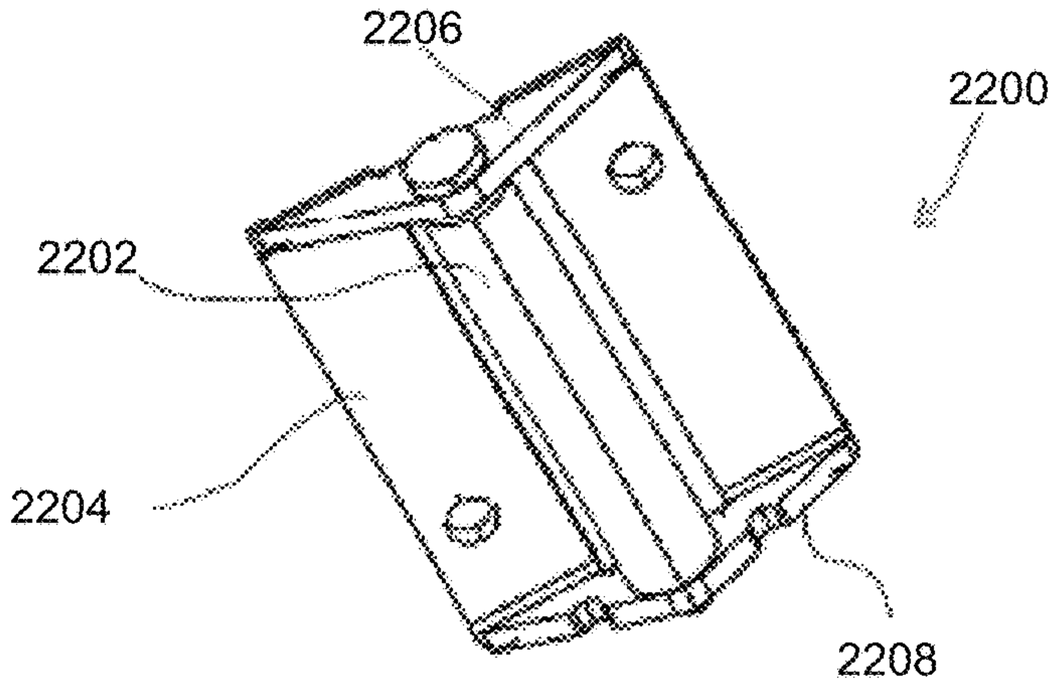

2206
2200
2202
2204
2208

FIG. 24

FIG. 22

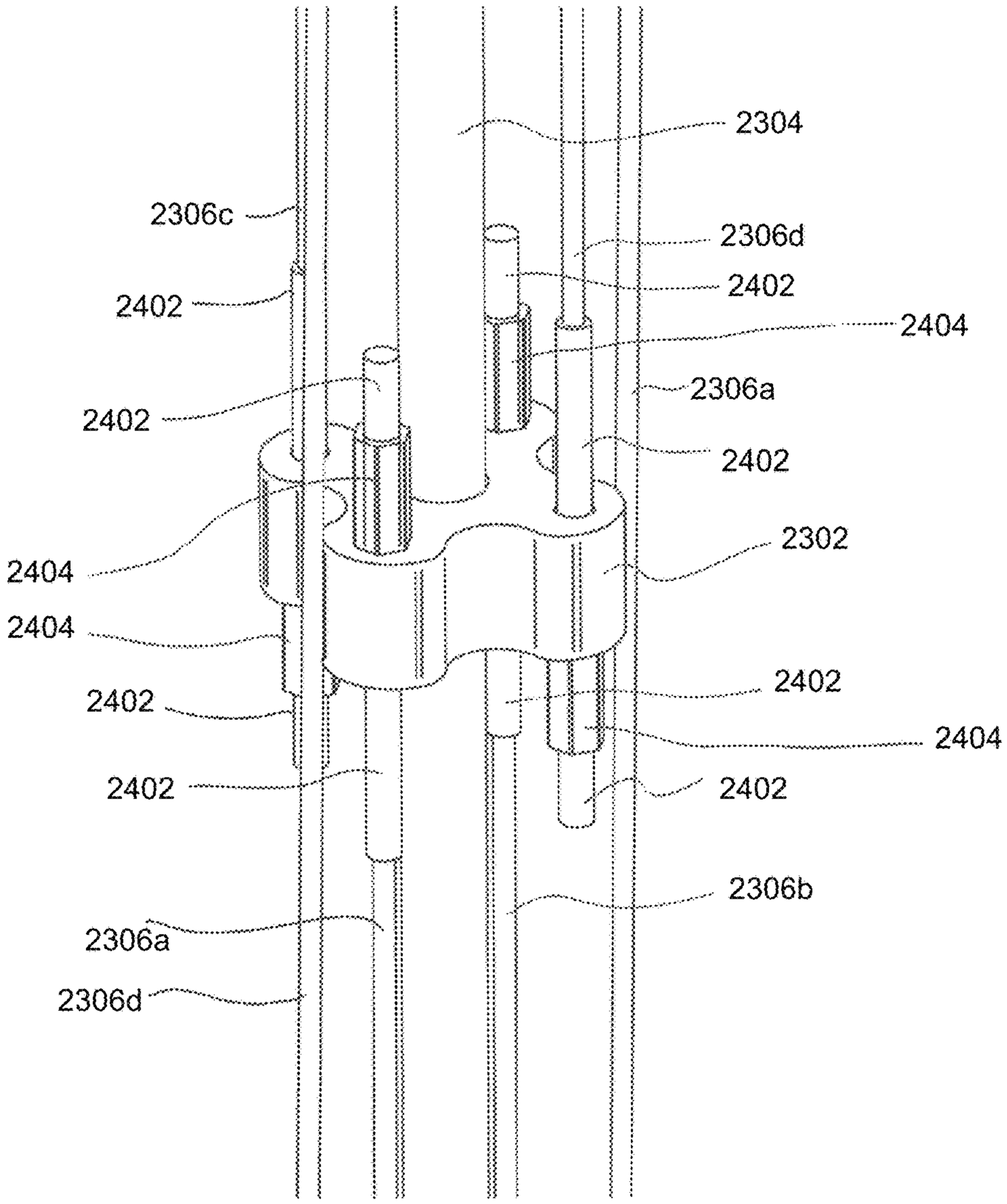

2304
2306c
2306d
2402
2402
2404
2402
2306a
2402
2404
2302
2404
2402
2402
2404
2402
2306b
2306a
2306d

FIG. 23

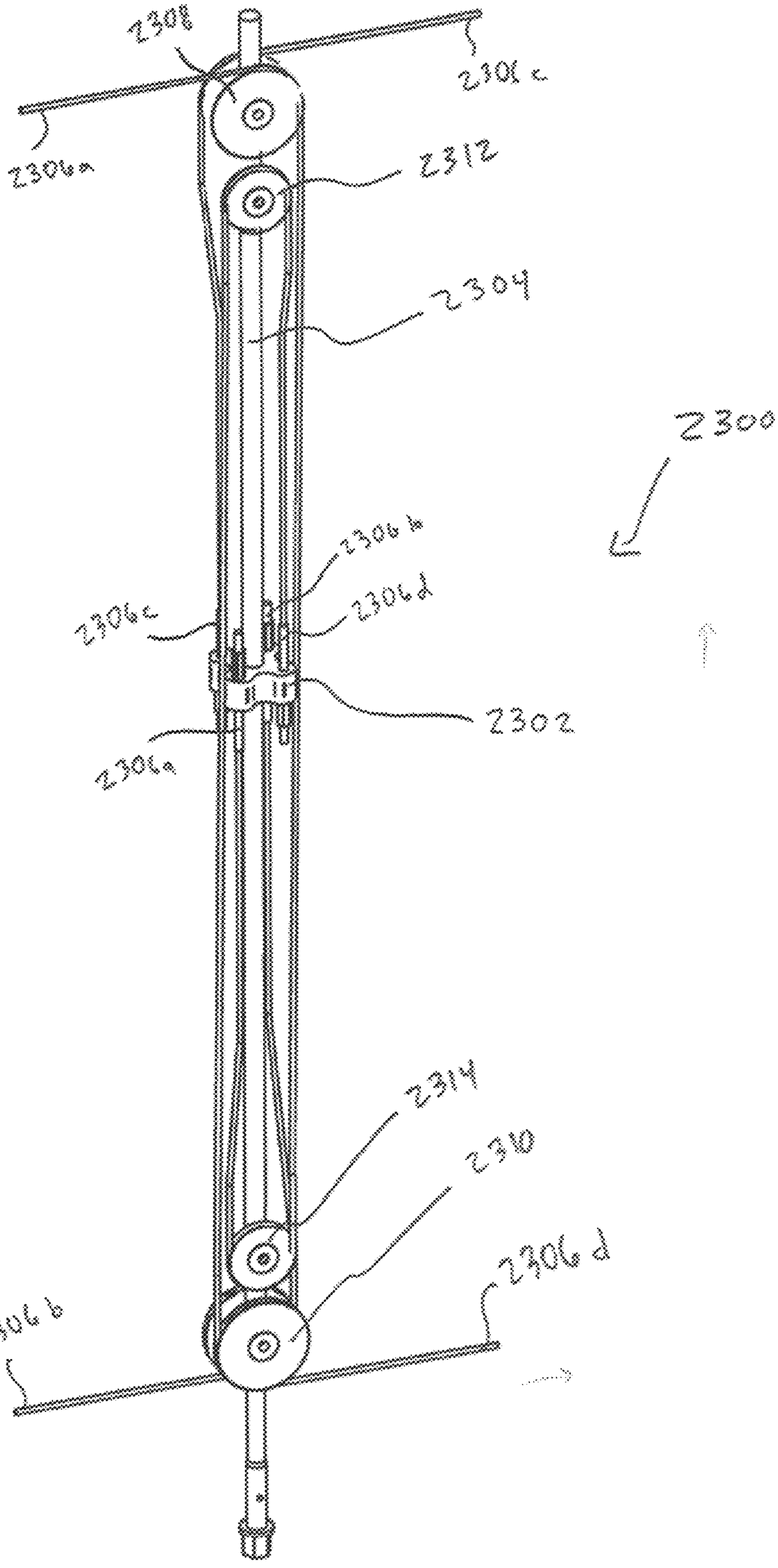
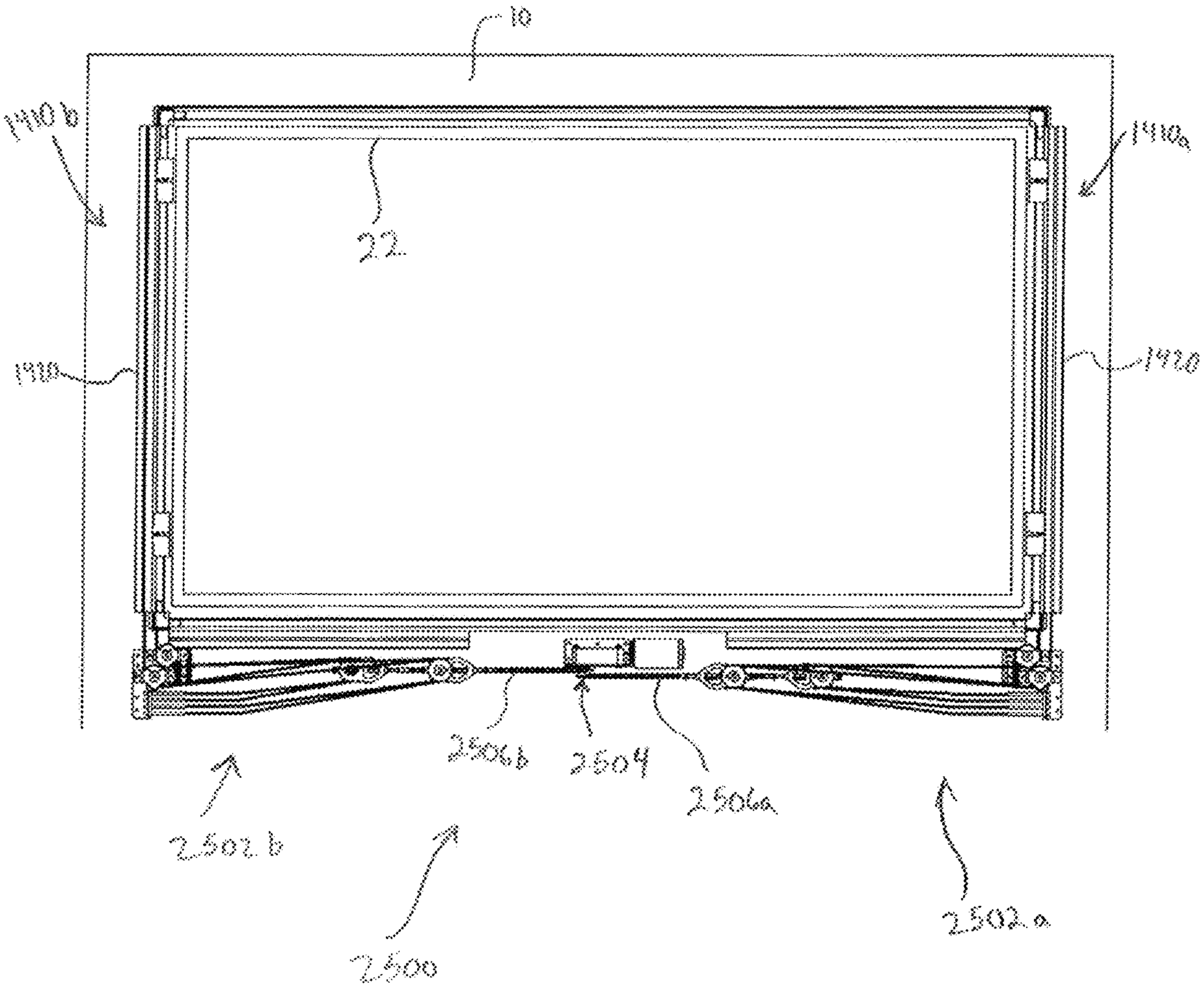

2308
2308c
2308a
2312
2304
2300
2306b
2306c
2306d
2302
2306a
2314
2310
2306d
2306b

FIG. 25


10
1410b
1410a
22
1430
1420
2506b
2504
2506a
2502b
2500
2502a

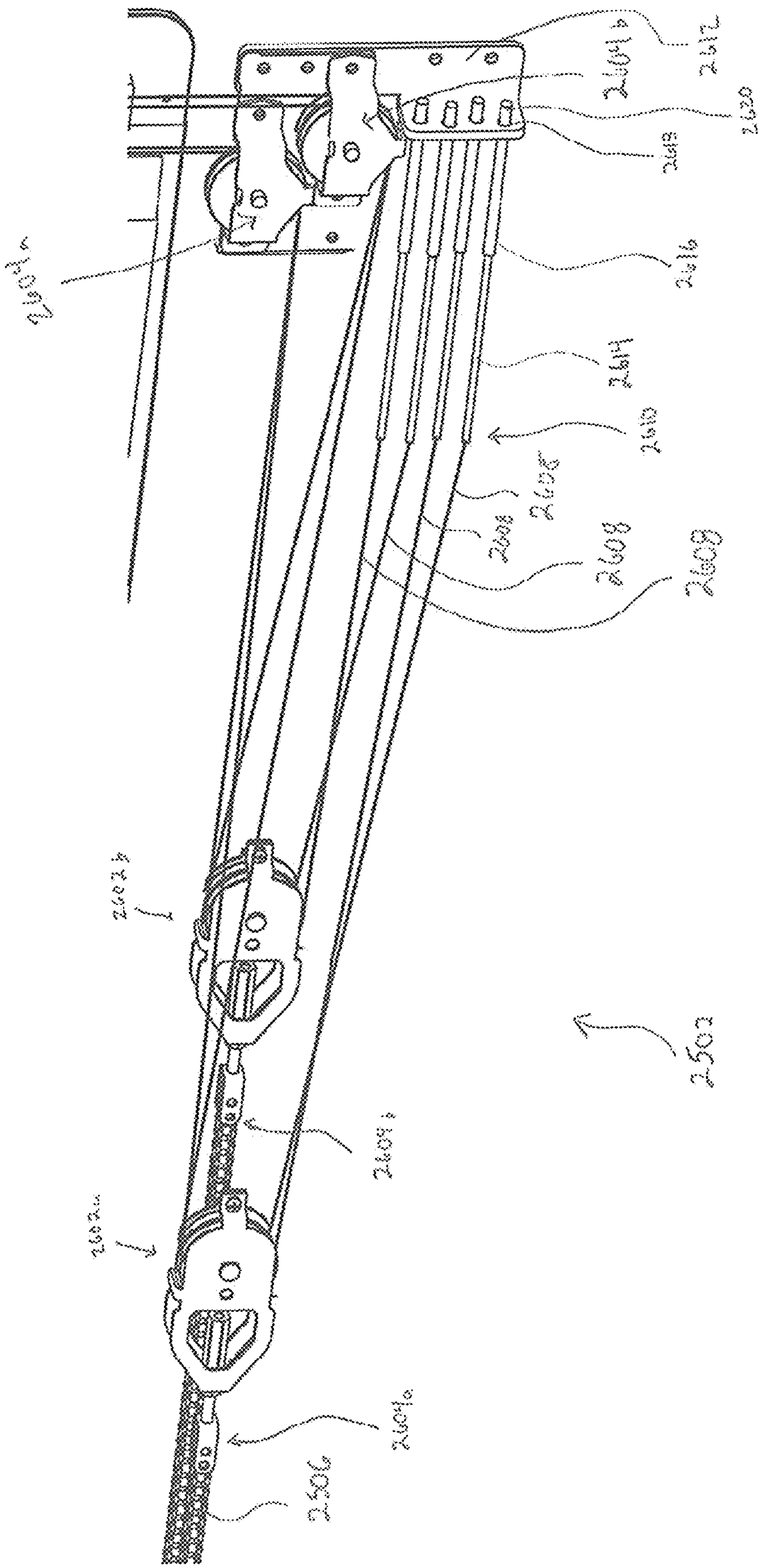
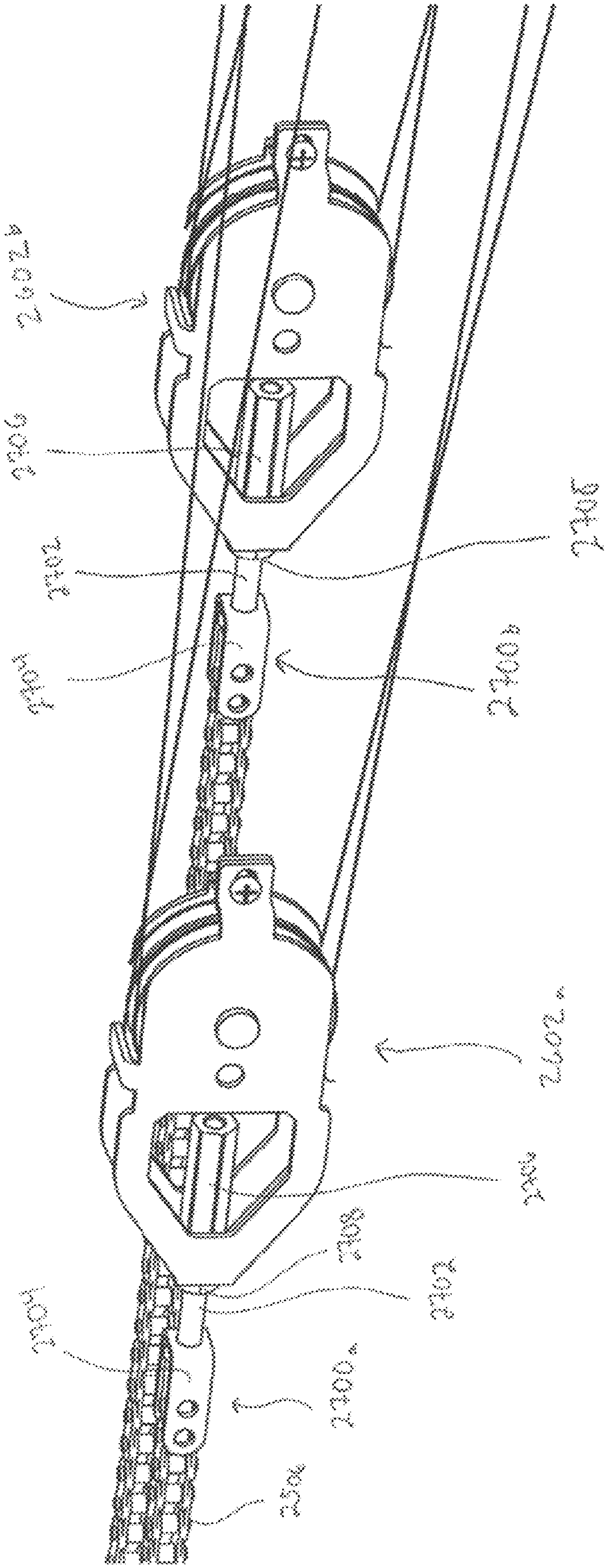


FIG. 26

FIG. 27



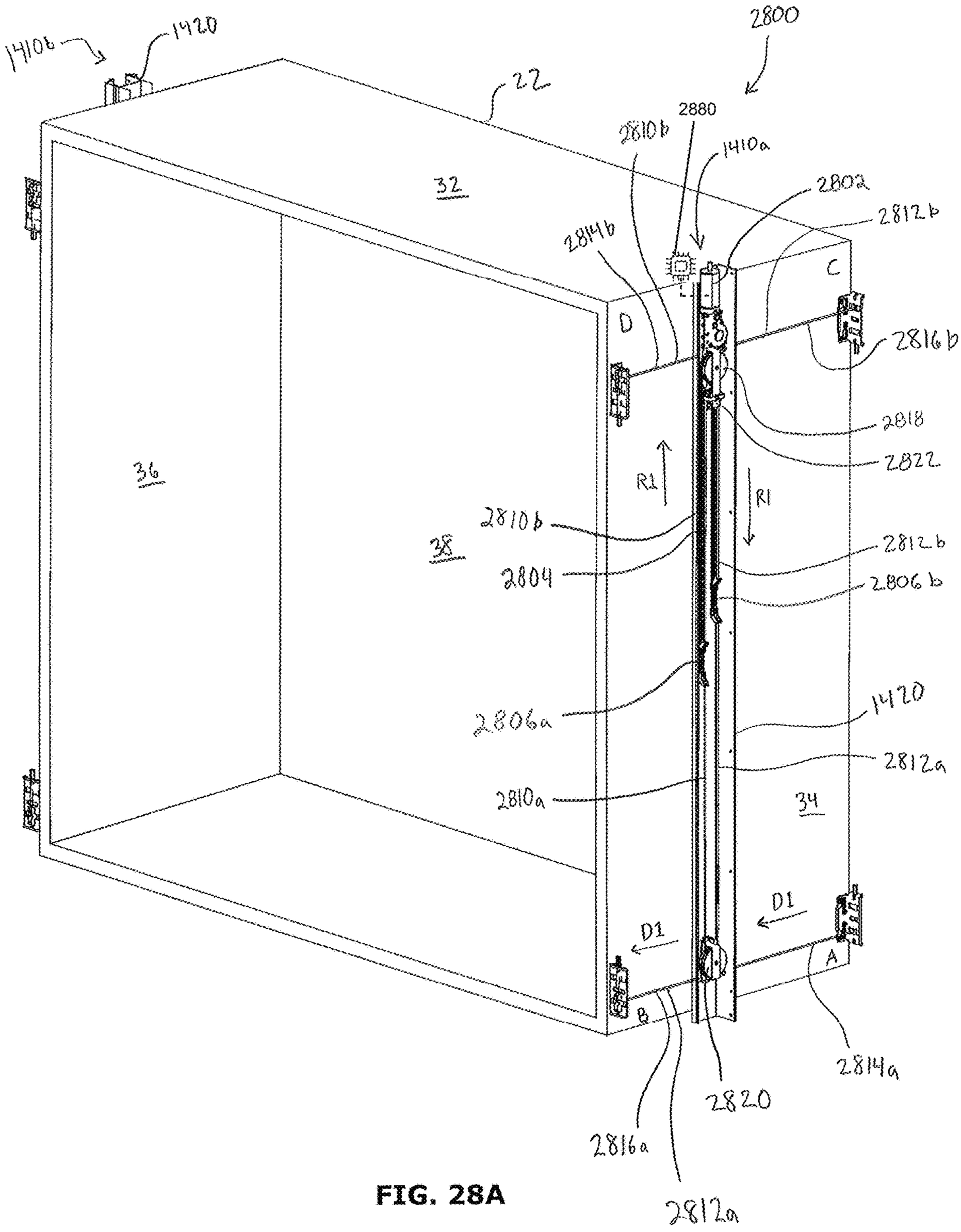

1410b
1420
2800
22
2880
2810b
1410a
32
2802
2814b
2812b
C
D
2816b
2818
2822
36
R1
R1
2810b
38
2812b
2804
2806b
2806a
1420
2812a
2810a
34
D1
D1
A
B
2814a
2820
2816a
2812a

FIG. 28A

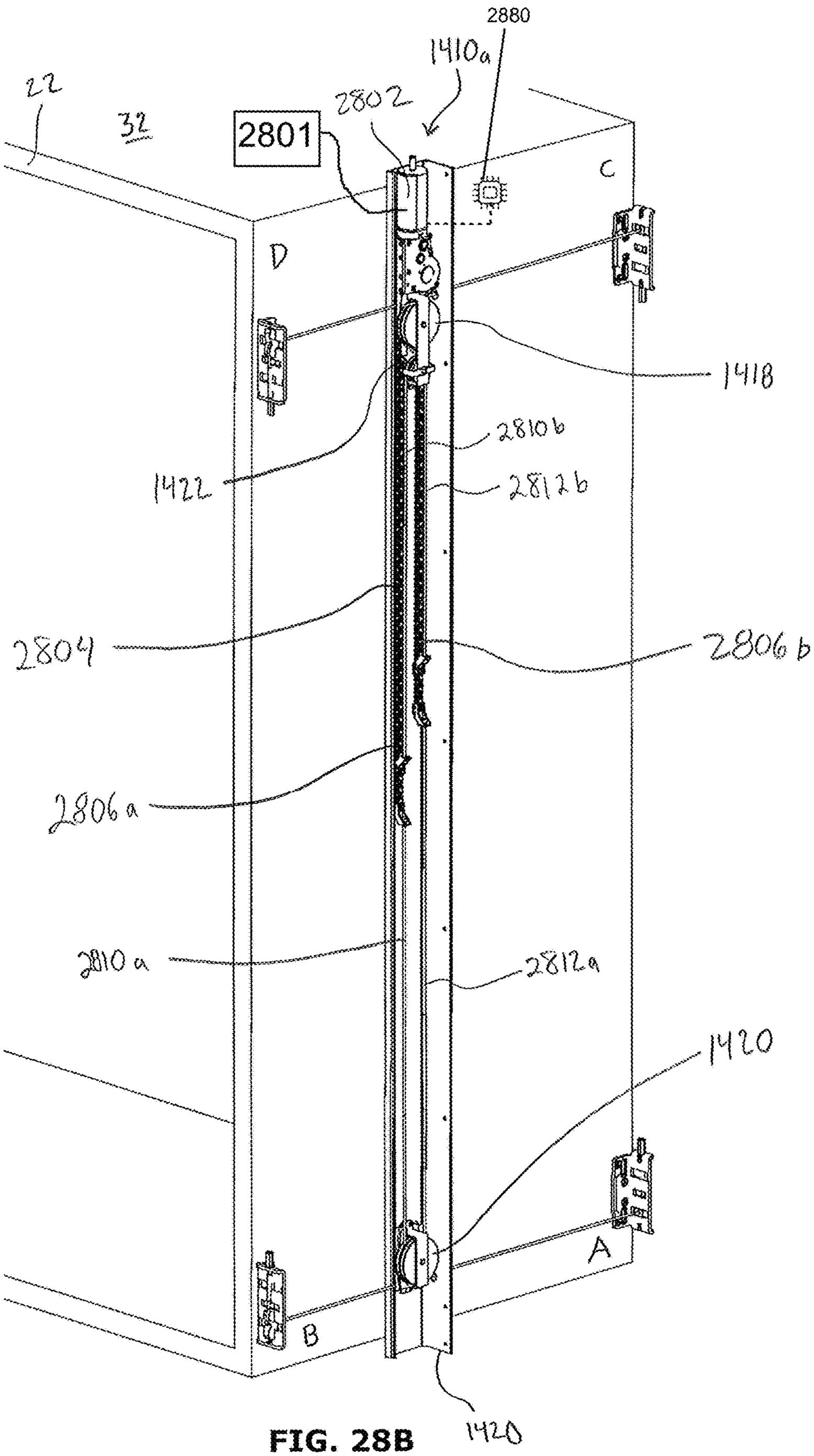

2880
1410a
22
32
2802
2801
C
D
1418
2810b
1422
2812b
2804
2806b
2806a
2810a
2812a
1420
A
B
1420

FIG. 28B

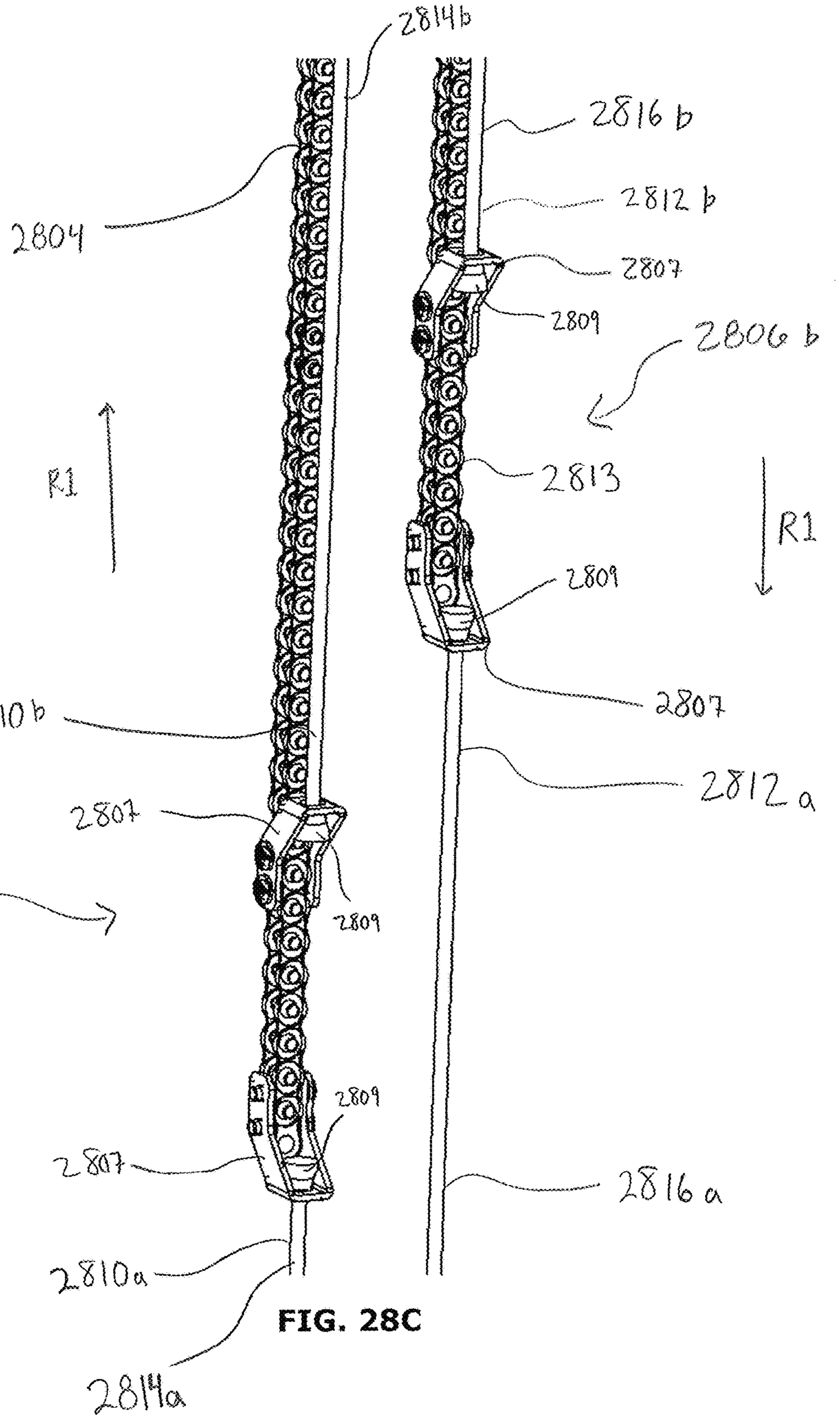

2814b
2816b
2804
2812b
2807
2809
2806b
R1
2813
R1
2809
2807
2810b
2812a
2807
2806a
2809
2809
2807
2816a
2810a
2814a

FIG. 28C

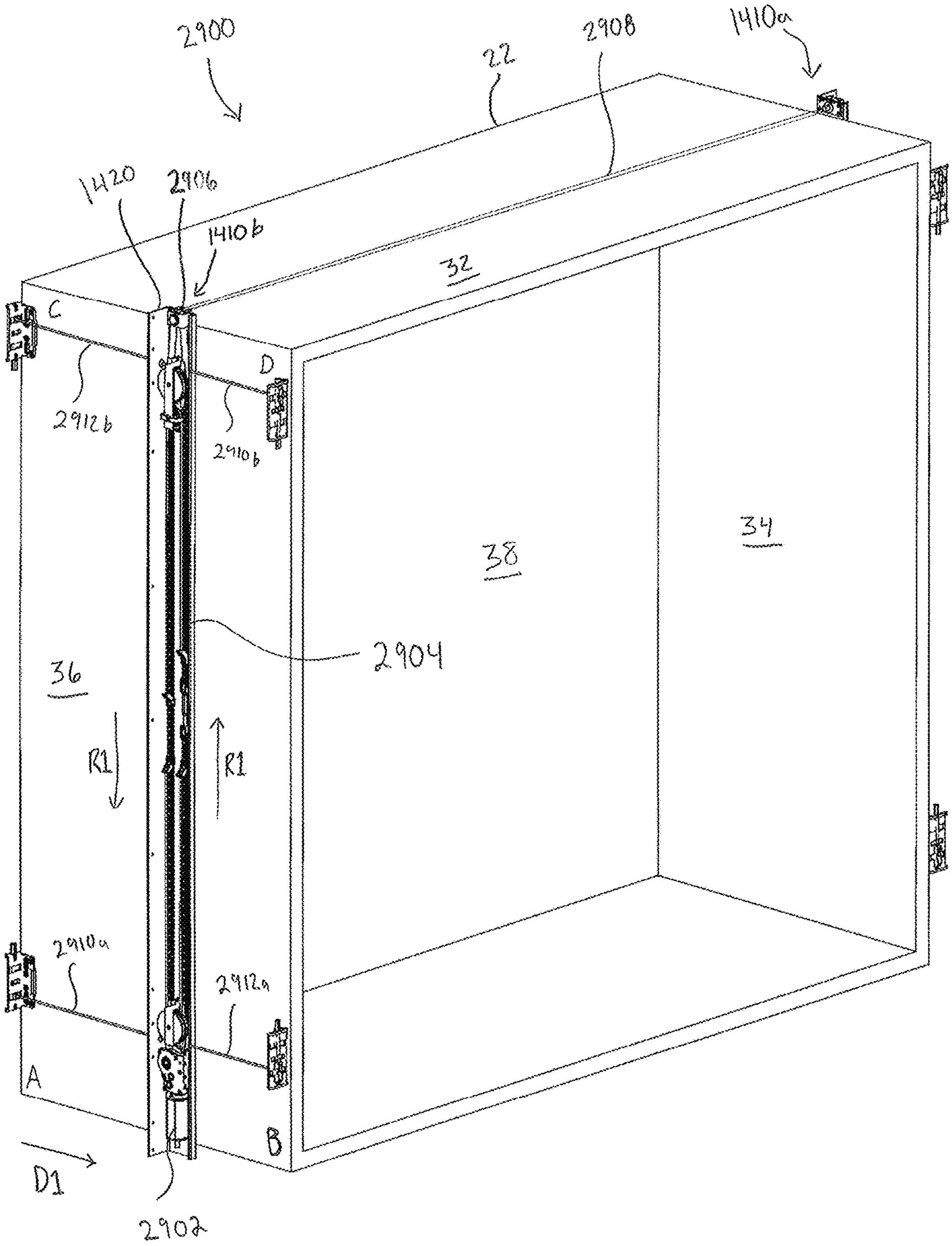

2900
22
2908
1410a
1420
2906
1410b
32
C
D
2912b
2910b
34
38
2904
36
R1
R1
2910a
2912a
A
B
D1
2902

FIG. 29A

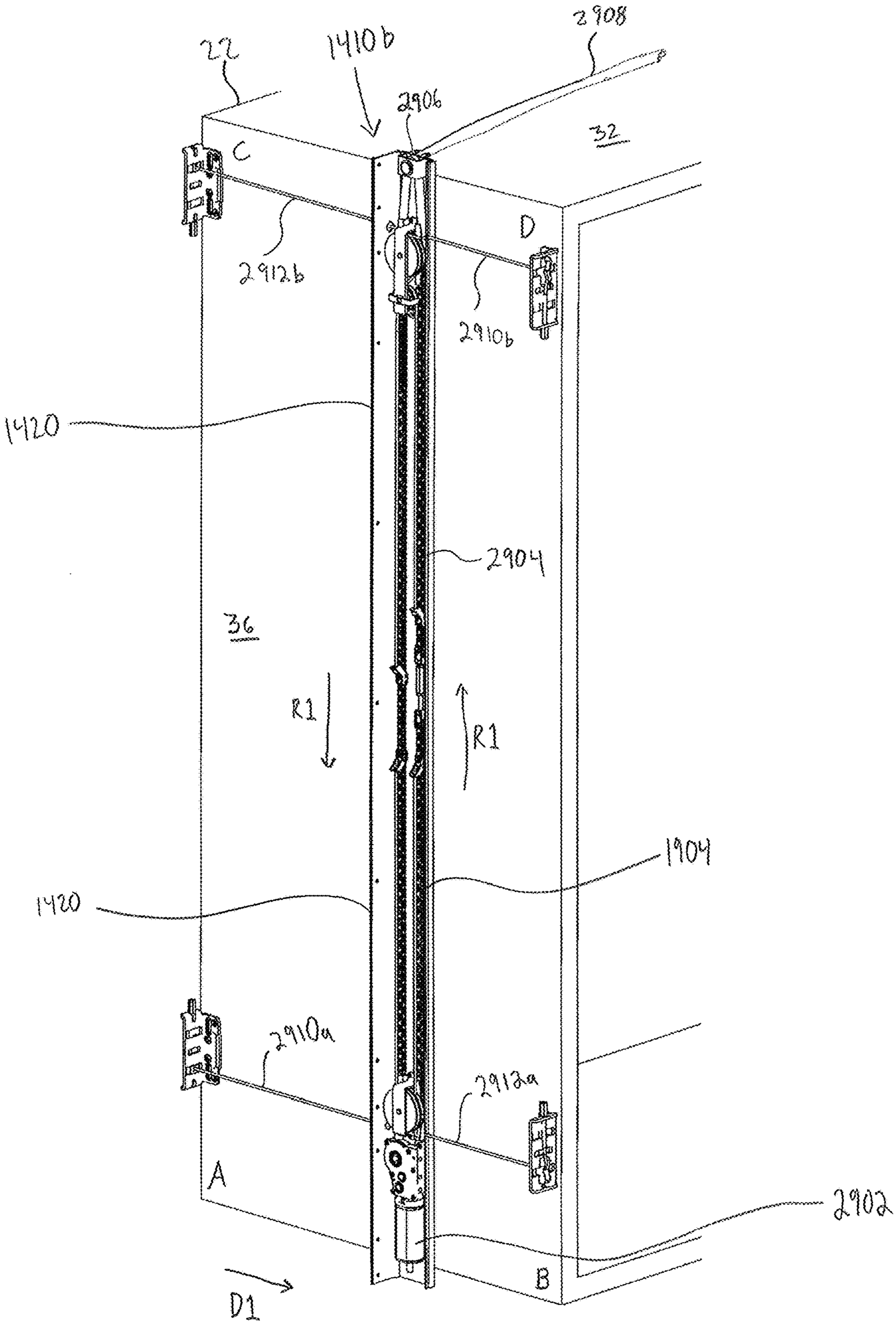

22
1410b
2908
2906
32
C
D
2912b
2910b
1420
2904
36
R1
R1
1904
1420
2910a
2912a
A
B
2902
D1

FIG. 29B

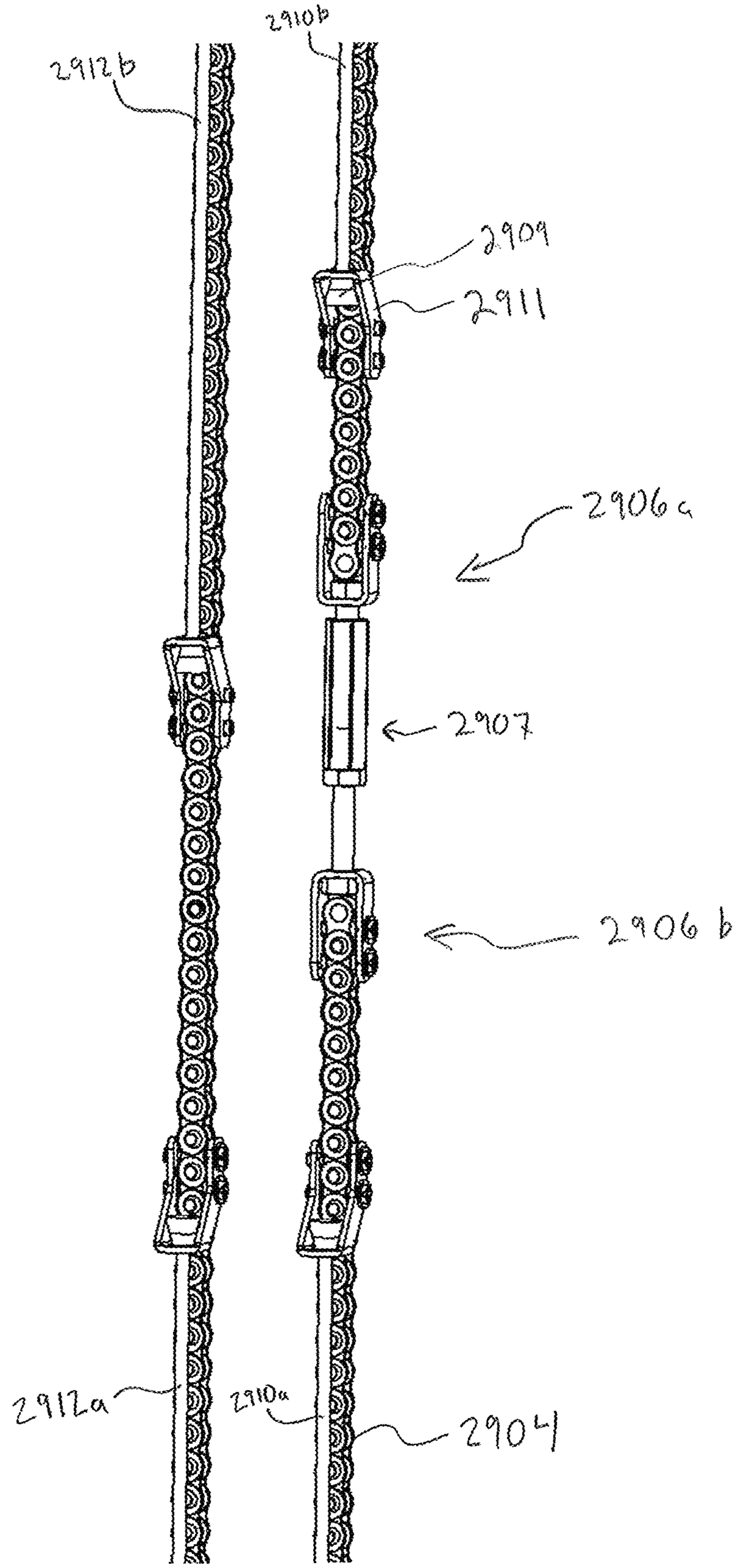


FIG. 29C

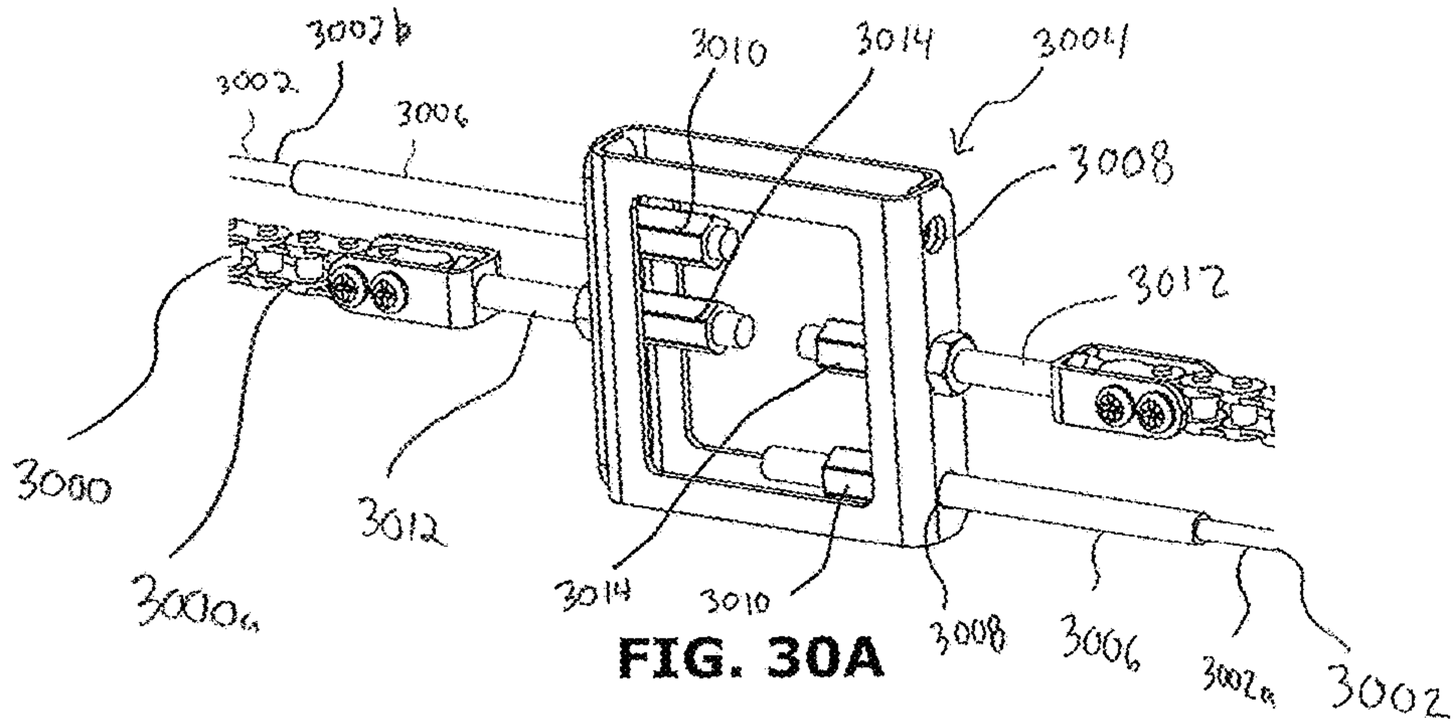


FIG. 30A

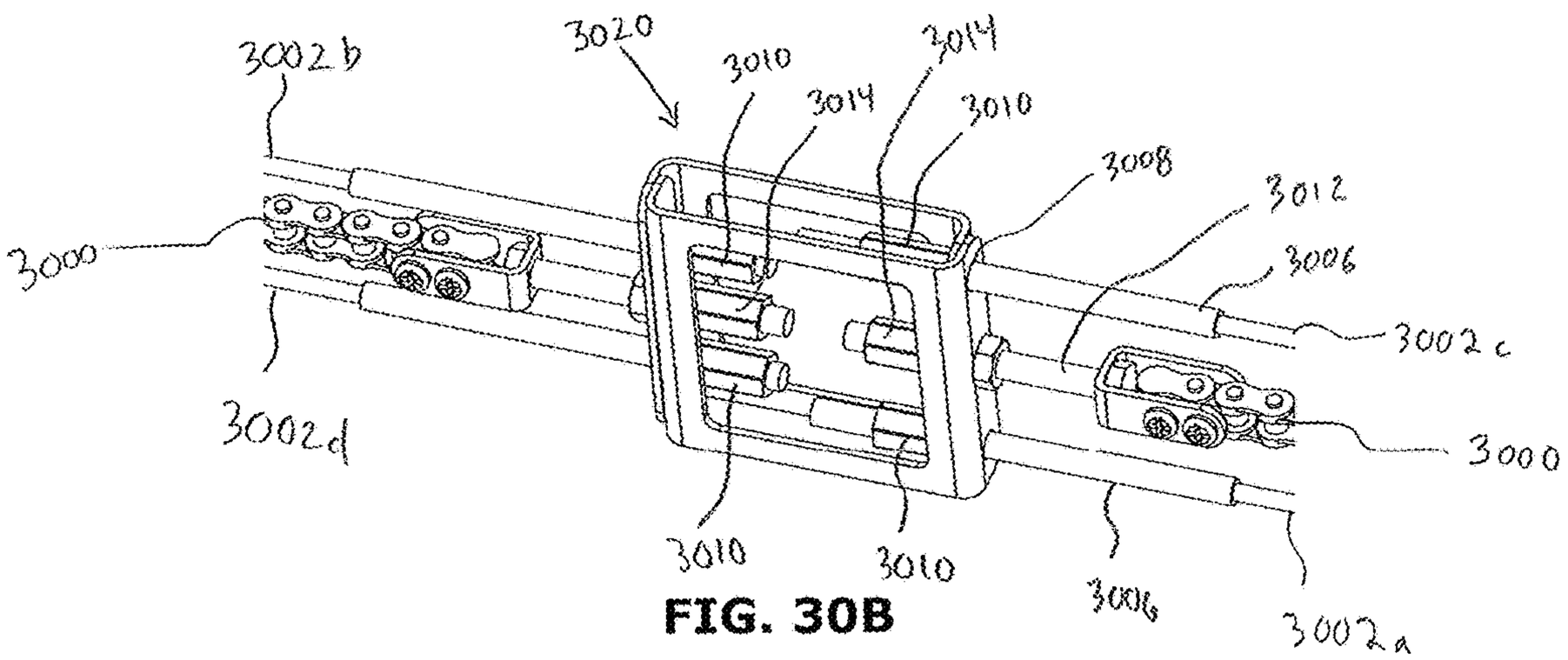


FIG. 30B

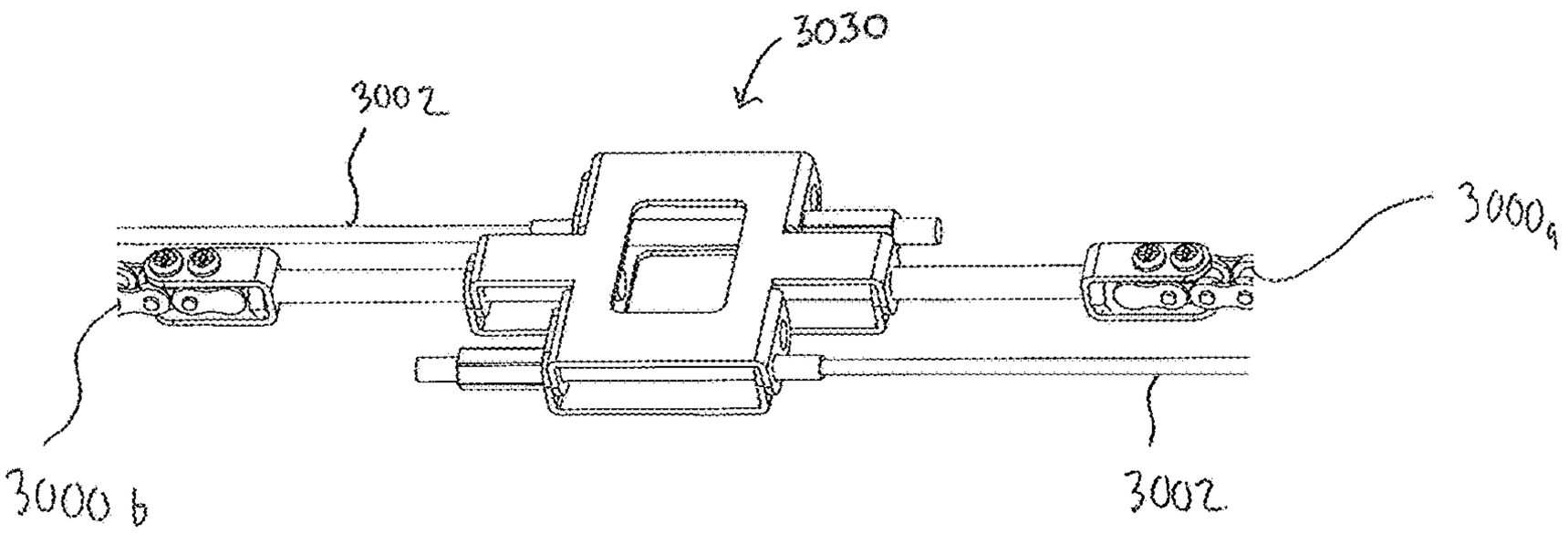


FIG. 30C

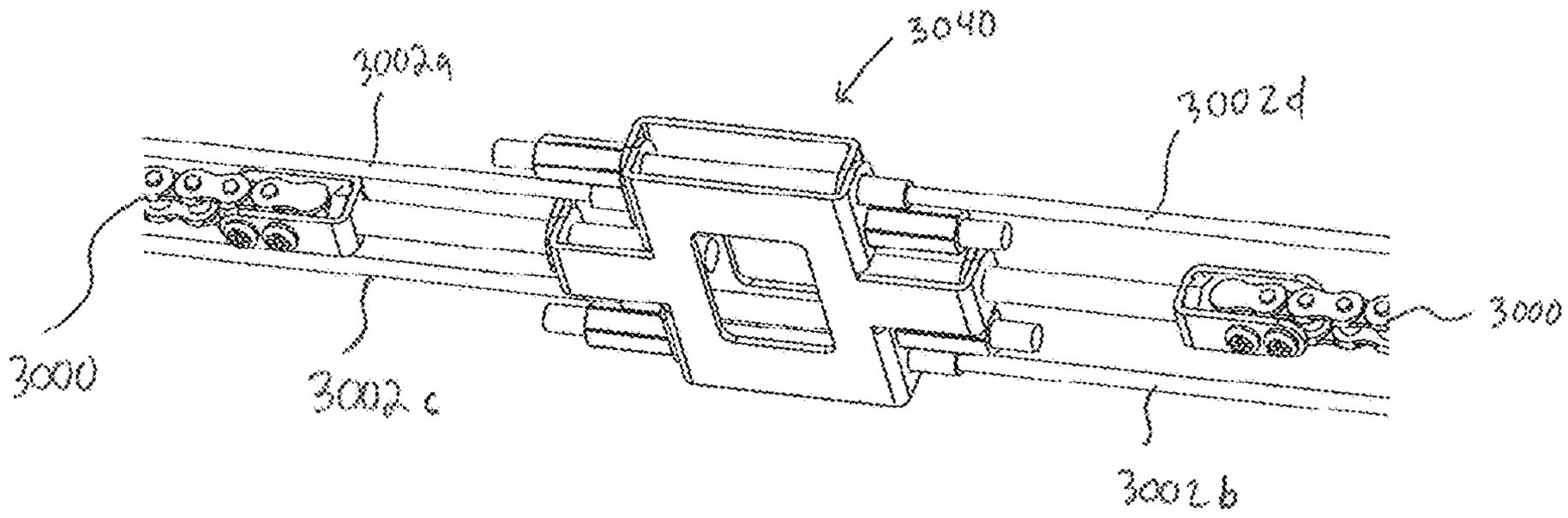


FIG. 30D

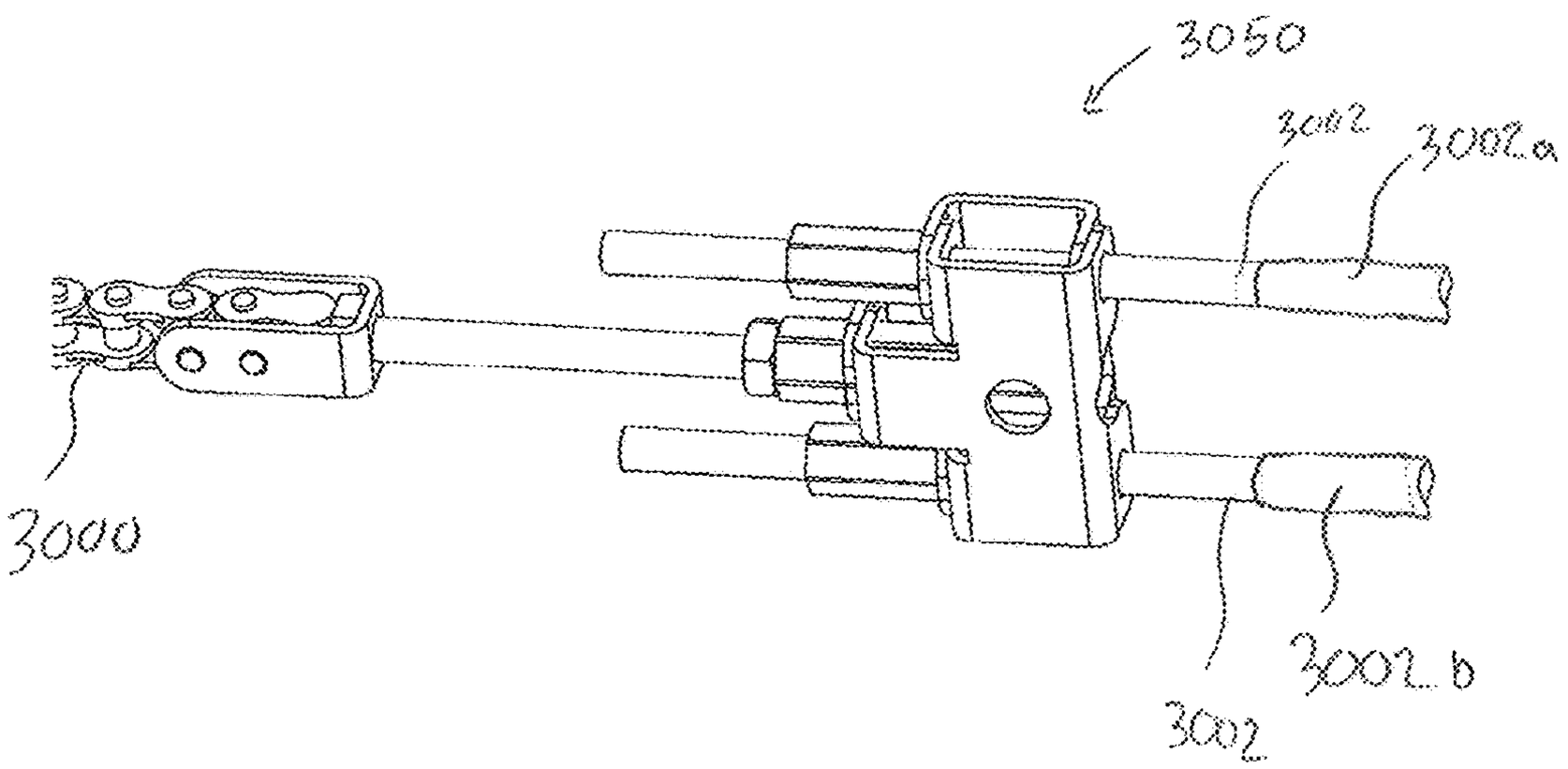


FIG. 30E

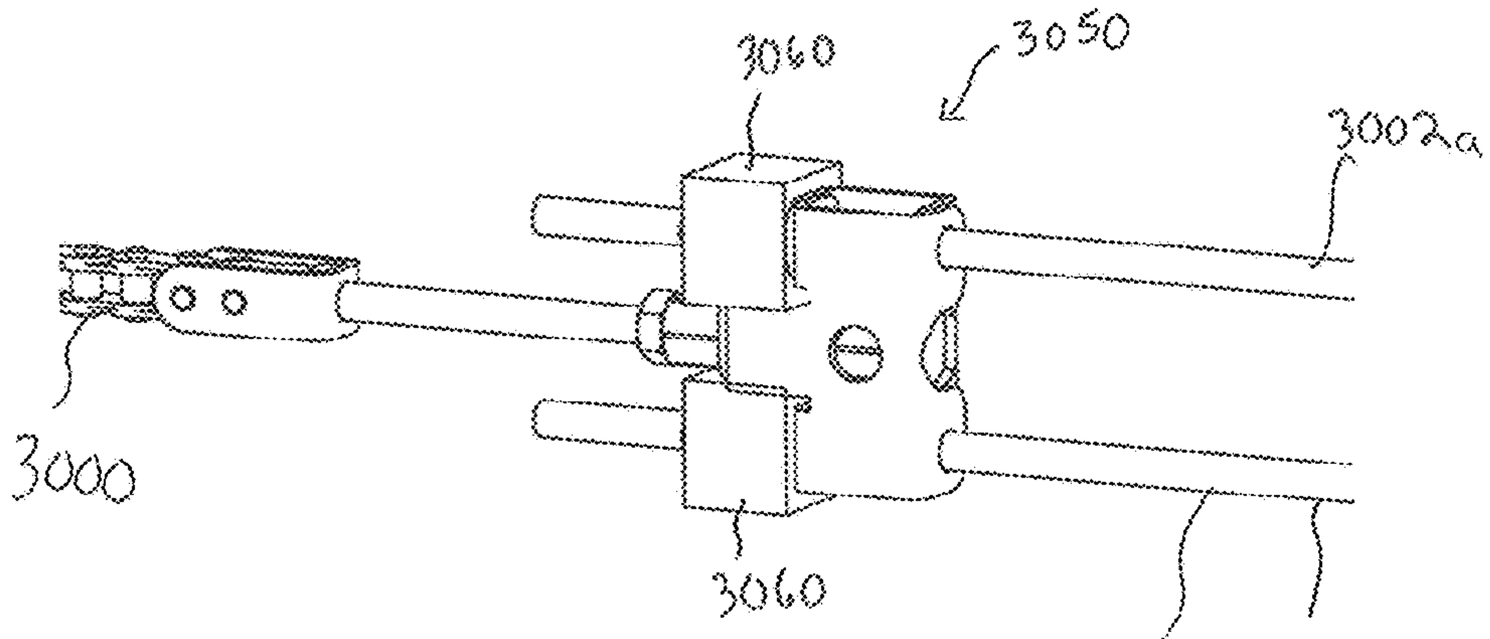


FIG. 30F

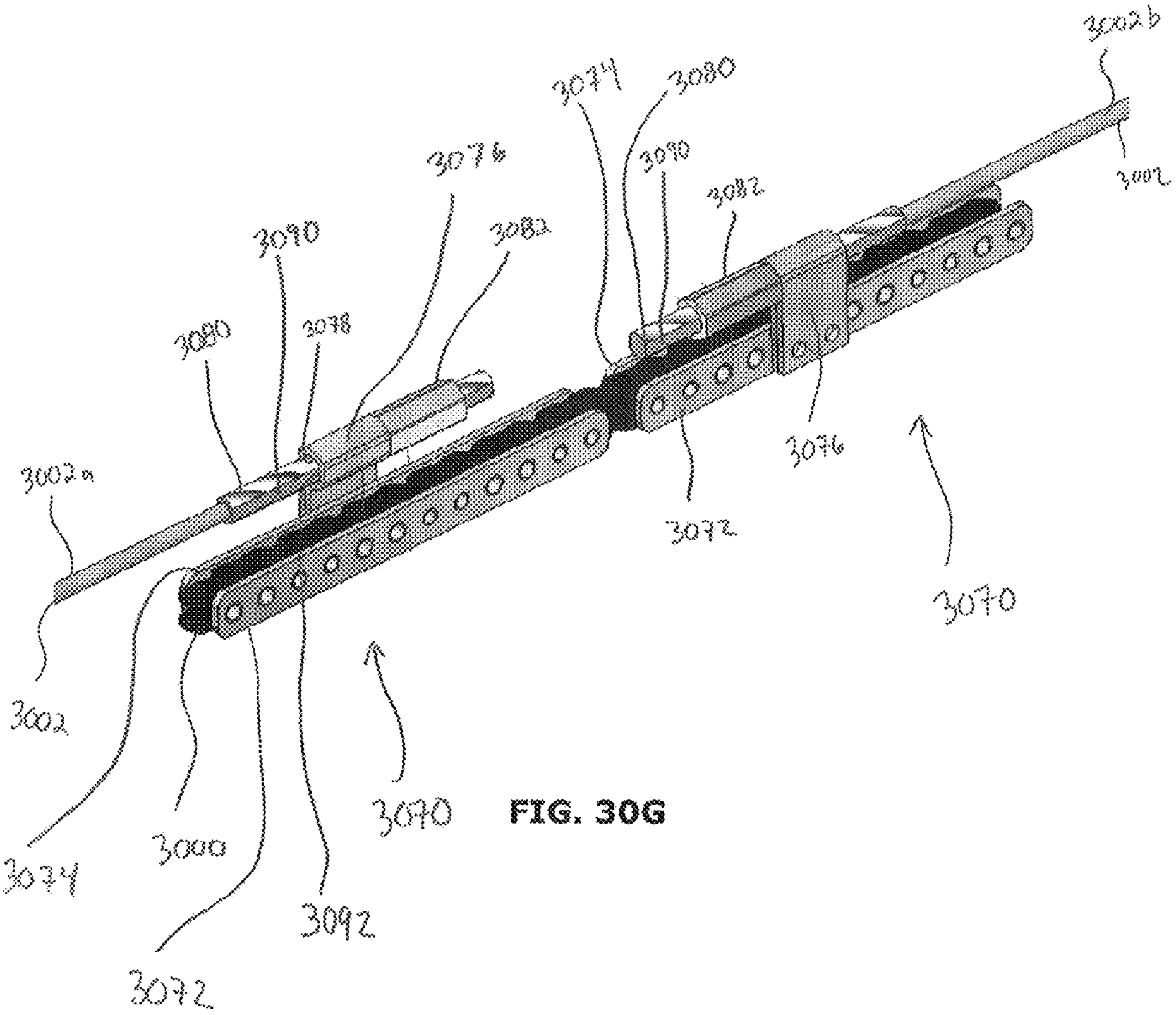

3002b
3074
3080
3090
3076
3082
3002
3090
3082
3080
3078
3076
3002a
3072
3070
3002
3074
3000
3070
3092
3072

FIG. 30G

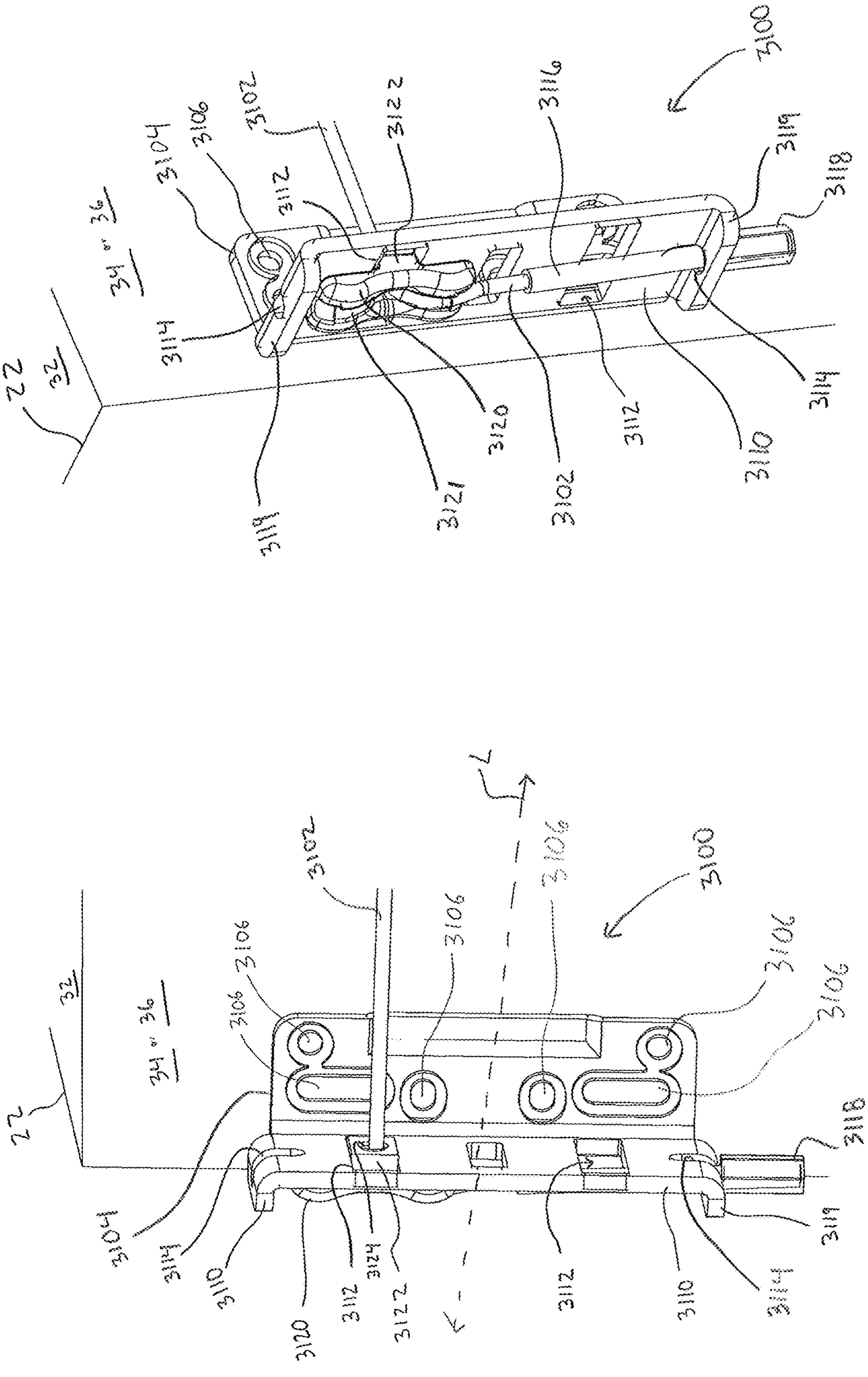


FIG. 31B

FIG. 31A

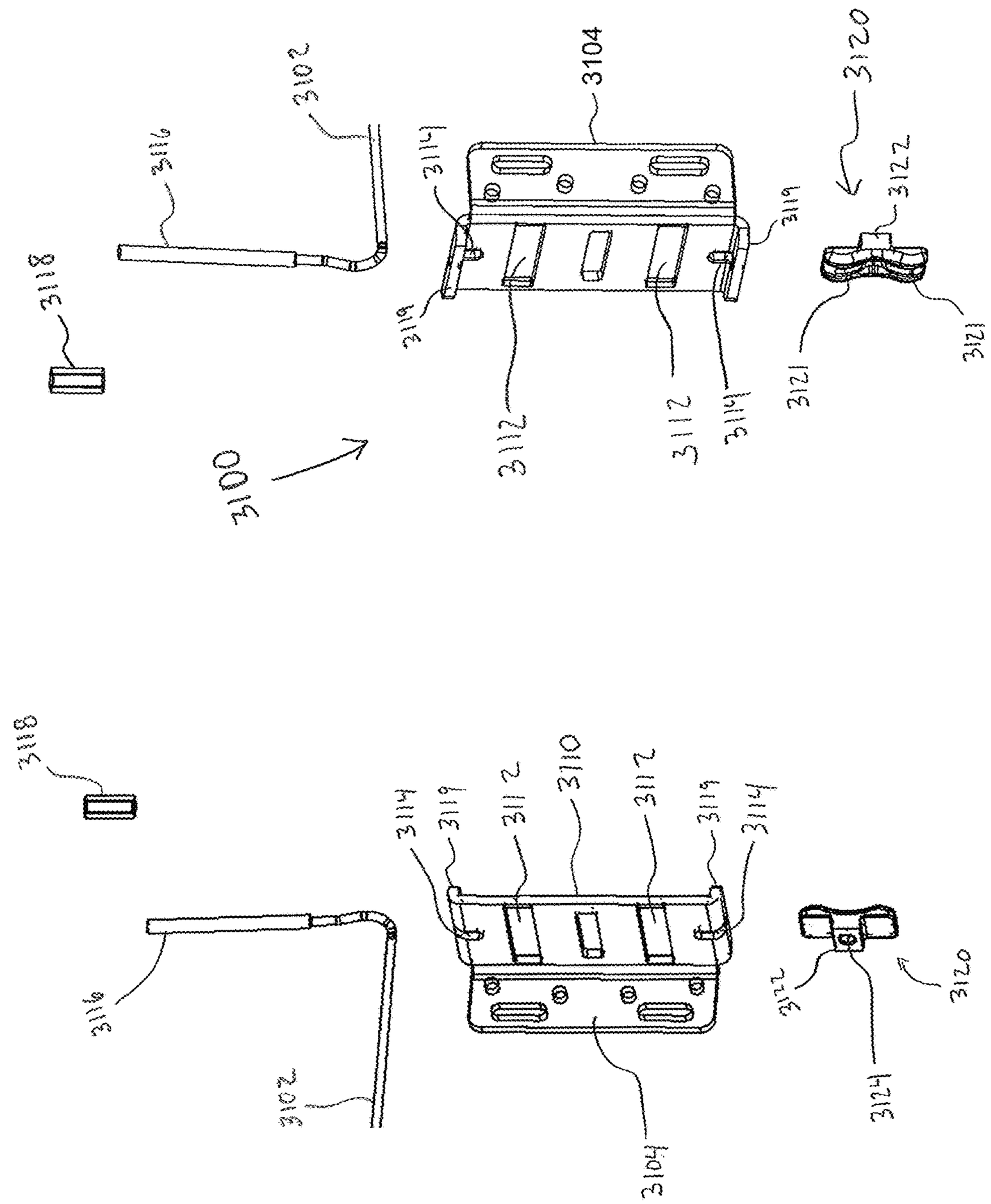


FIG. 31C

FIG. 31D

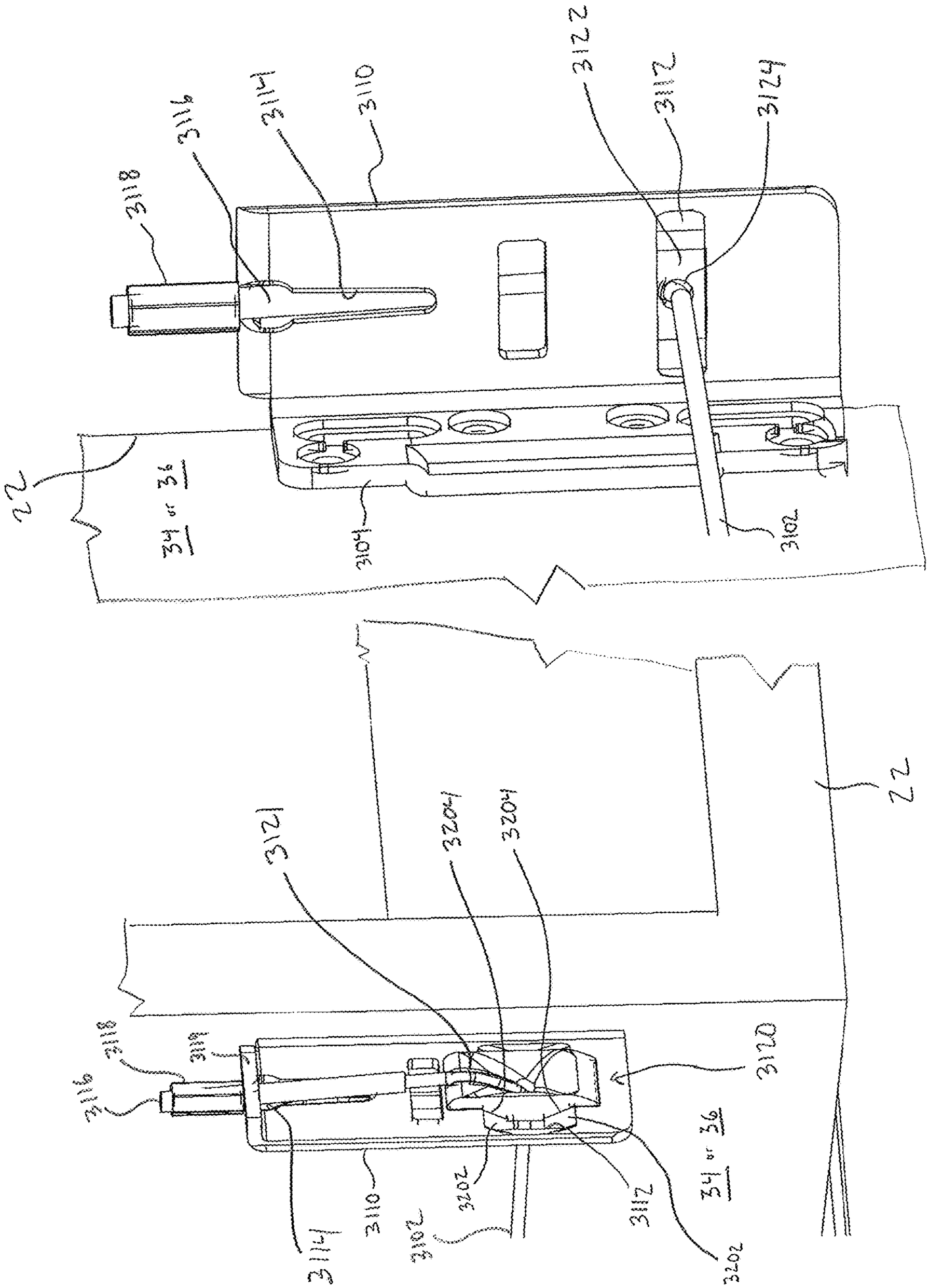


FIG. 32B

FIG. 32A

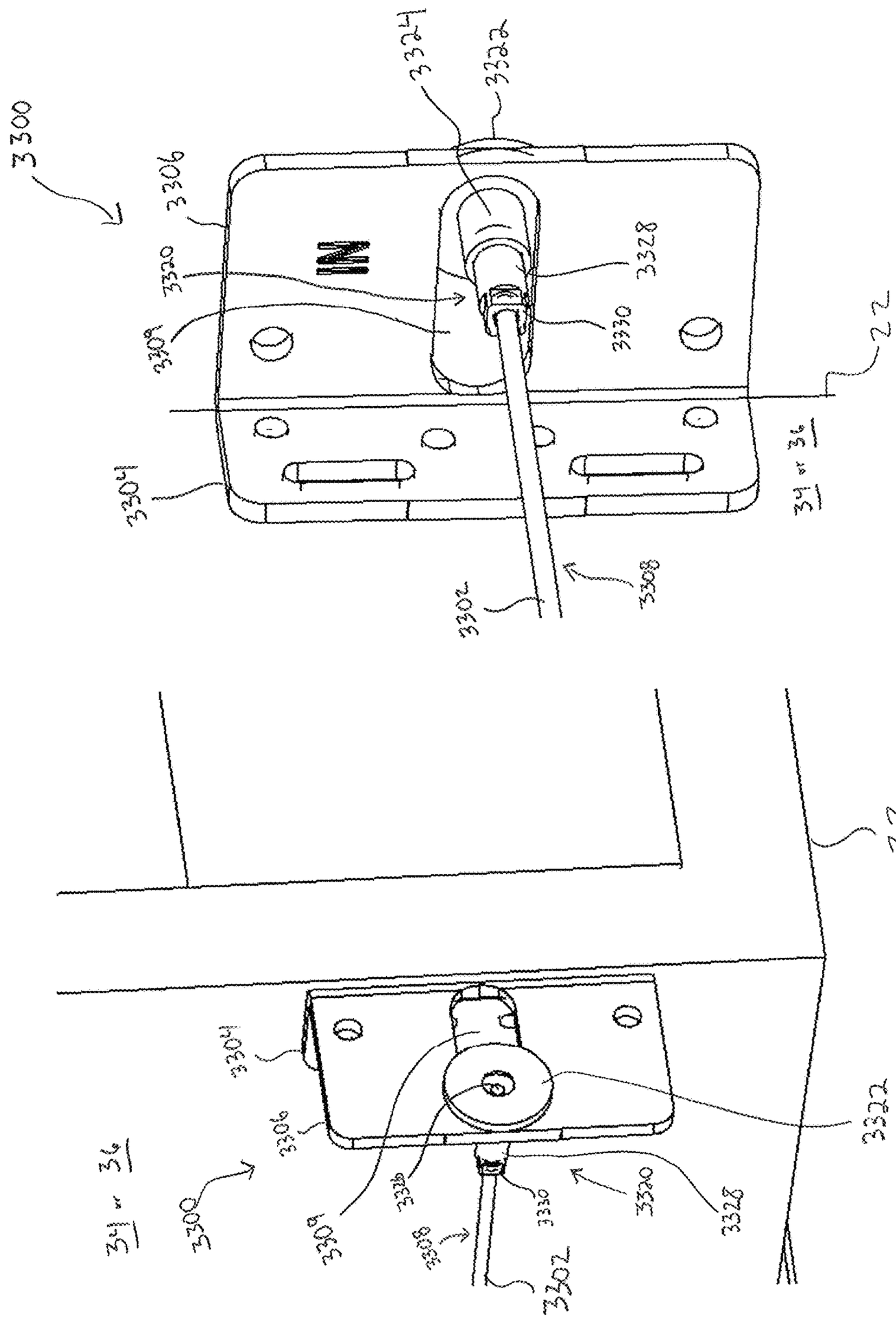


FIG. 33B

FIG. 33A

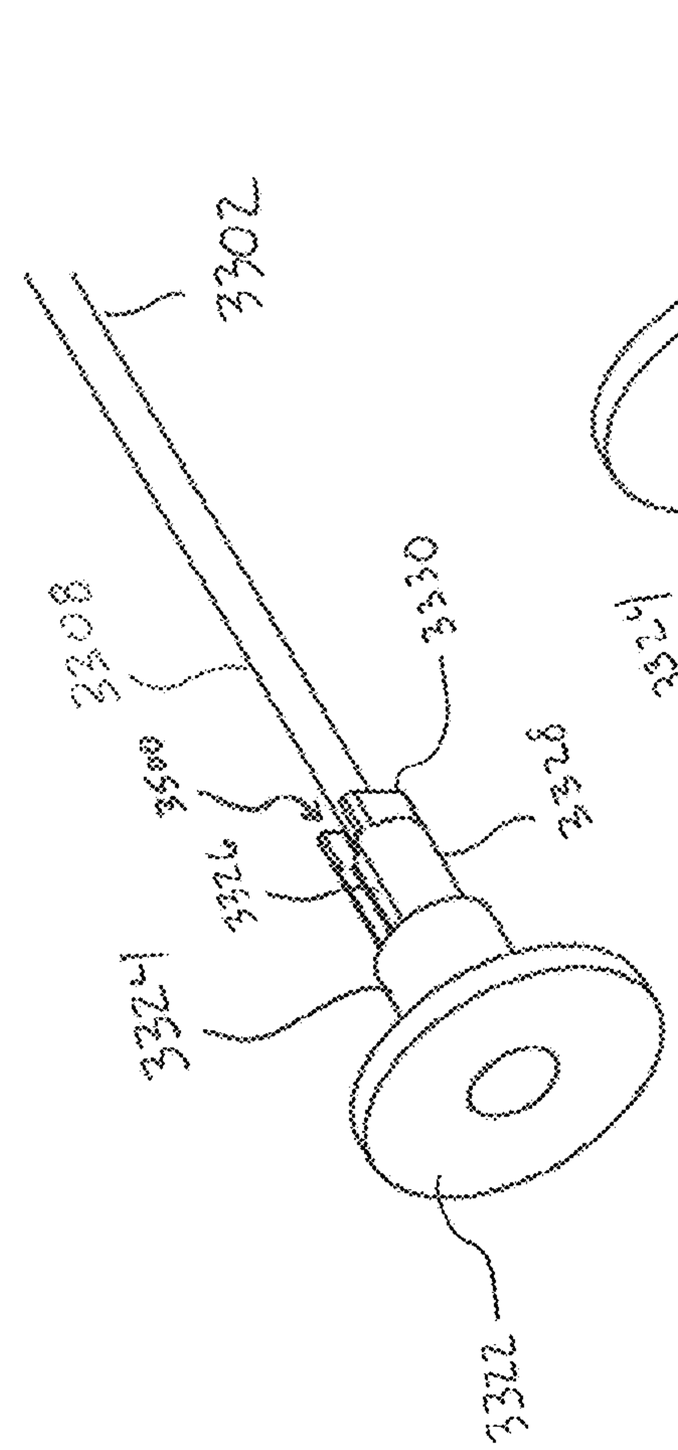


FIG. 35A

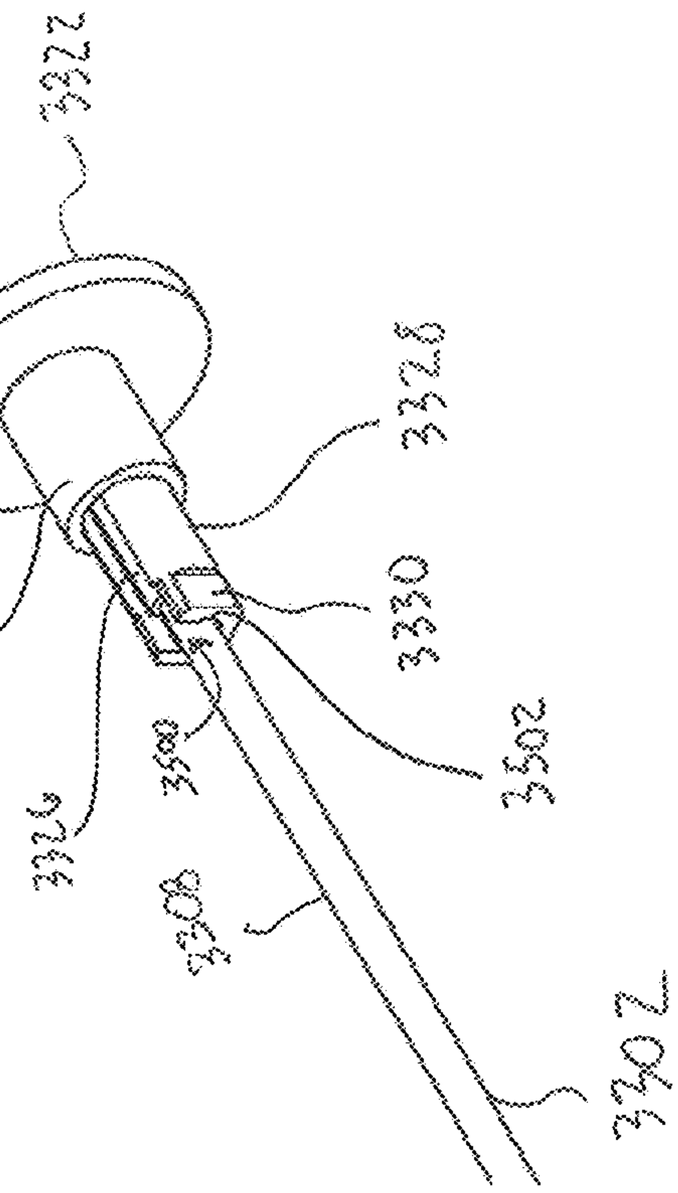


FIG. 35B

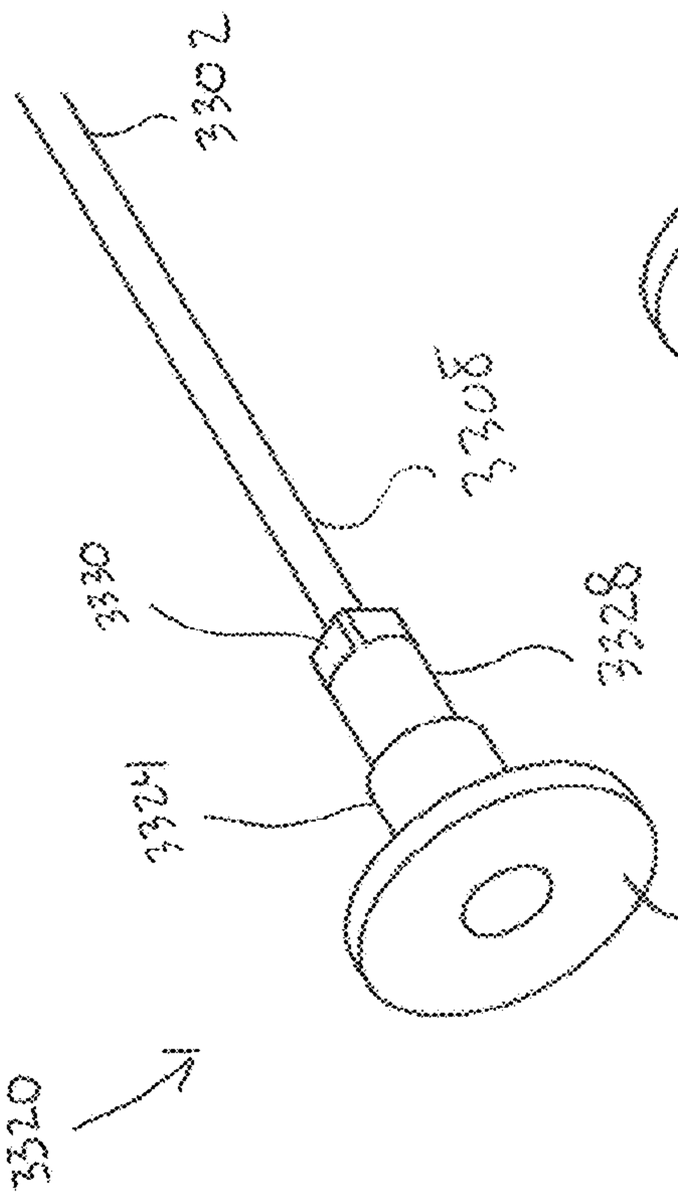


FIG. 34A

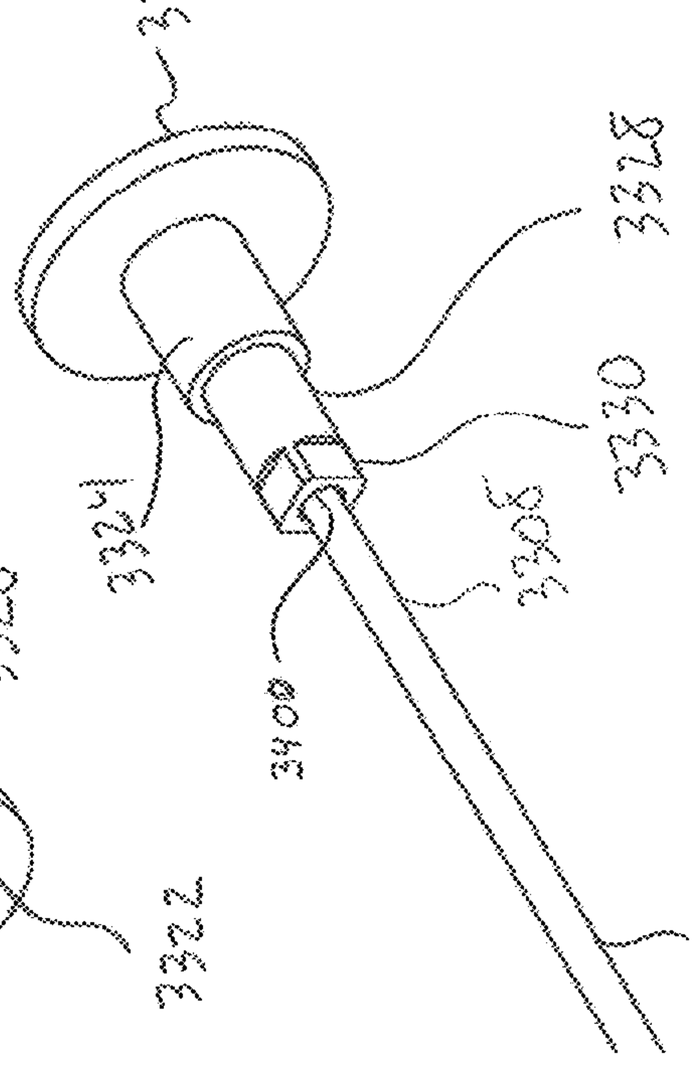


FIG. 34B

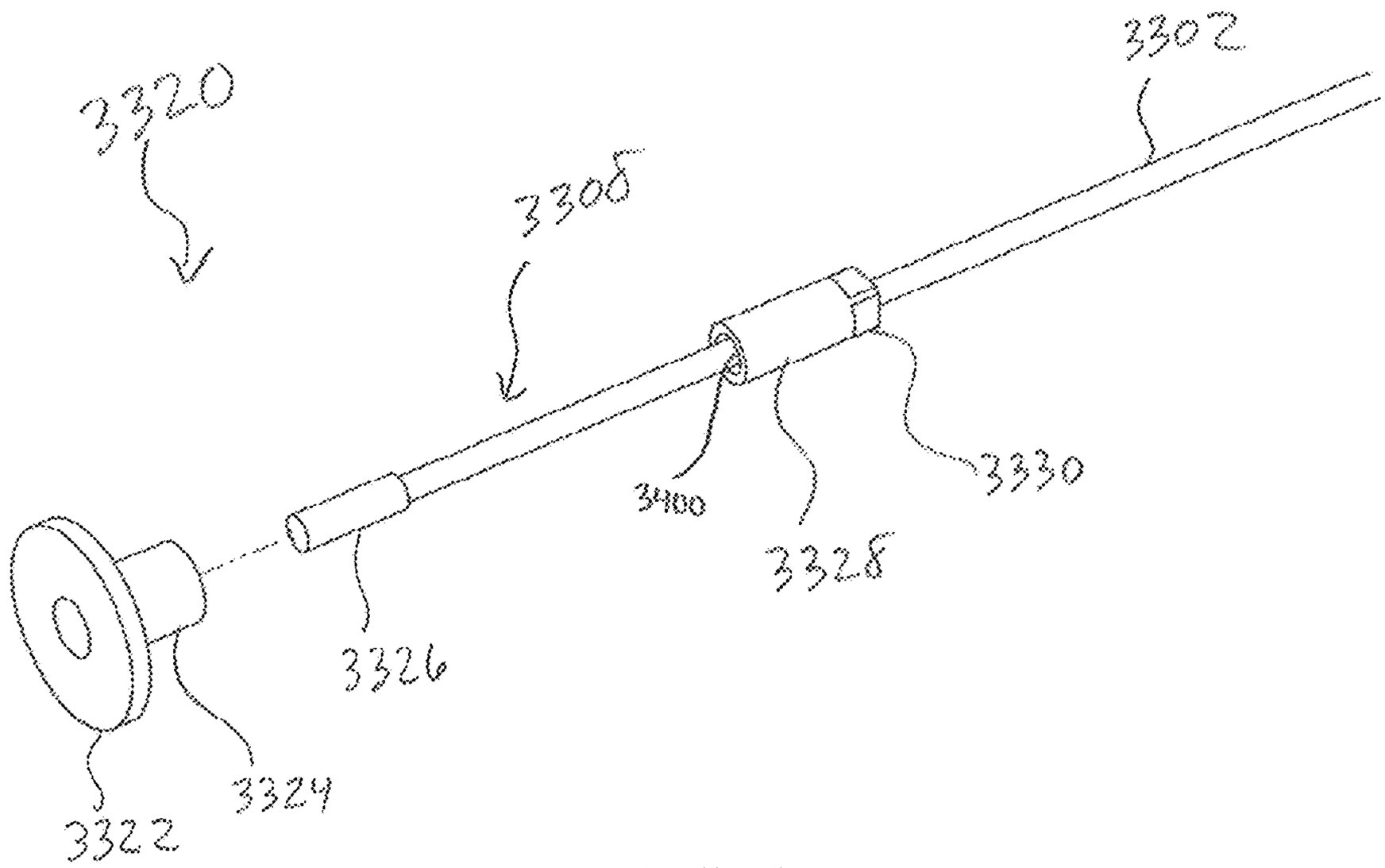


FIG. 34C

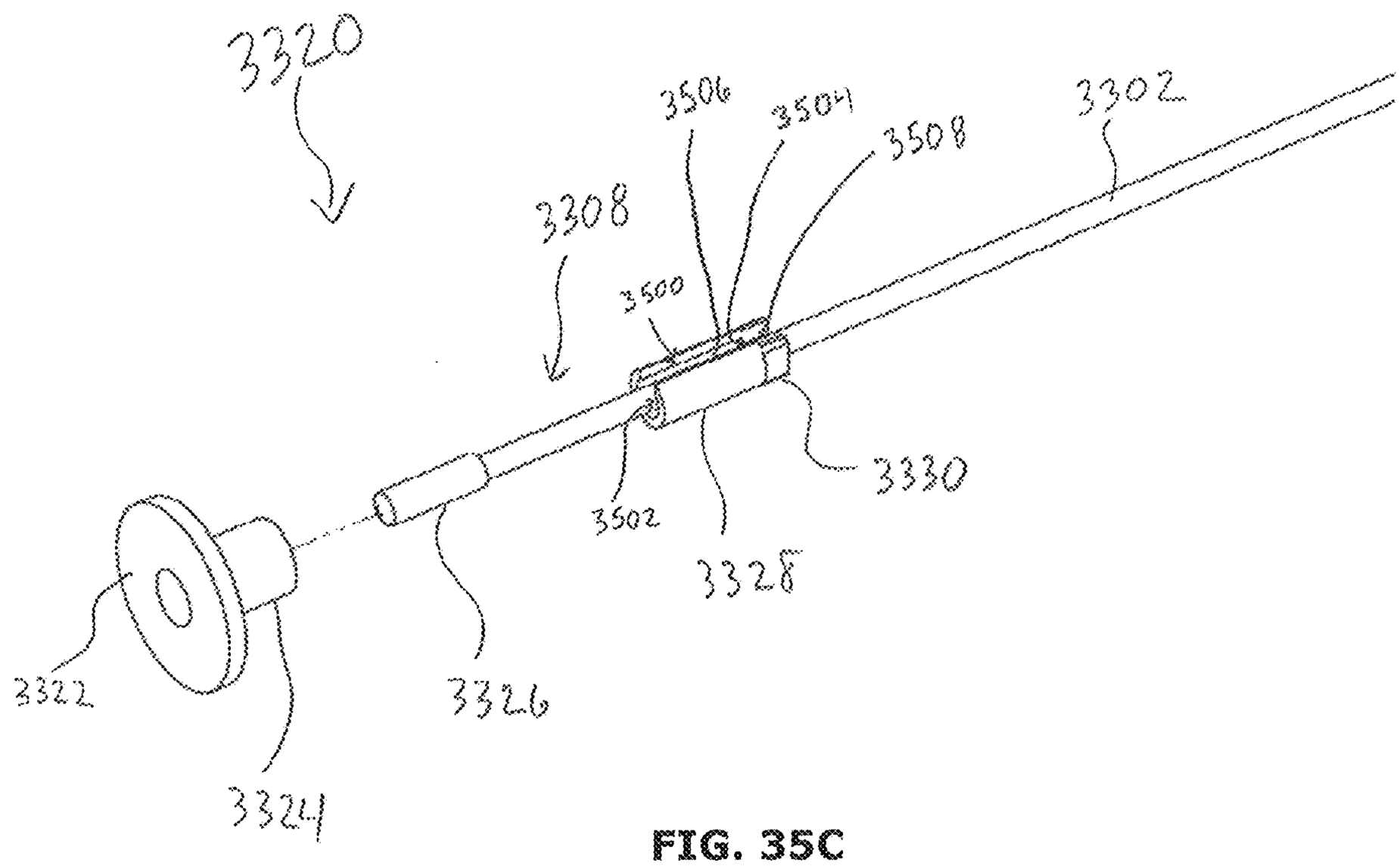


FIG. 35C

SLIDABLE ROOM ASSEMBLIES

CROSS-REFERENCE TO RELATED APPLICATION

This patent application claims priority to and the benefit of provisional patent application 62/732,330 filed on Sep. 17, 2018, and provisional patent application 62/858,712 filed on Jun. 7, 2019, both of which are incorporated by reference herein in their entirety, and this patent application is a continuation-in-part of U.S. patent application Ser. No. 16/136,528 filed on Sep. 20, 2018, which claims priority to provisional patent application 62/562,084 filed on Sep. 22, 2017, which is incorporated by reference herein in its entirety.

TECHNICAL FIELD

The disclosures herein relate in general to slidable room assemblies. More particularly, aspects herein relate to slidable room assemblies installed within vehicle jambs.

BACKGROUND

The present subject matter relates to a slidable room assembly, particularly to a slidable room assembly for a vehicle having a slide-out room or compartment that is retracted when the vehicle is in motion and may be extended to afford more room when the vehicle is parked. More particularly, this subject matter relates to a slidable room assembly that includes an improved mechanism for reciprocation of the slide-out unit relative to the vehicle.

Recreational vehicles, including motor homes, fifth wheel trailers and travel trailers may be provided with an extendible slide-out unit for increasing the vehicle's living space. This slide-out unit may be extended for use when the vehicle is parked and is retracted in a telescoping manner when the vehicle is to be moved.

Prior vehicle slide-out installations that include an extension/retraction system that relies on screws or a pinion for effecting telescoping movement of the slide-out unit relative to the vehicle are known. Screws, in particular, must be short for practical reasons, including the tendency of a longer screw to deflect so that the axis of the screw is not absolutely straight. This, of course, greatly impairs operability of the screw. Pinions must also be comparatively short for practical reasons, including excessive weight in a pinion of greater length. Since the amplitude of movement of the slide-out room or compartment can be no greater than the length of the screw or pinion, the amplitude of sliding movement, and hence the amount of additional space gained by the slide-out compartment, is limited.

Other types of slide-out installations for vehicles are also known. One such installation employs an endless cable that passes over one pair of pulleys supported by a main part of a mobile home and a second pair of pulleys mounted on sidewalls of an extension part of the mobile home to cause the extension part to reciprocate. Another slide-out installation shows an expanding caravan, which also includes a rotatable shaft and two types of cables wound there around. Rotation of the shaft in one direction causes one type of cable to wind as the other type unwinds, causing a sliding unit to reciprocate in one direction (say, outwardly) relative to the vehicle. Rotation of the shaft in the opposite direction causes the sliding unit to move in the opposite direction (say, inwardly relative to the vehicle).

A challenge with slidable room assemblies is that a slide-out room is cantilevered as it is extended. The outer end of the extended slide-out room tends to tip downwardly. This puts weight on the slide-out unit's operating mechanism. The cantilevered slide-out room also tends to be loose at the top and tight at the bottom. This puts weight on the slide-out mechanism, which, in turn, impairs slidability and also invites leakage.

Another challenge with presently known slide-out units is that they require modification of the vehicle's underframe, unless the slide-out unit is of small size. For example, it may sometimes be necessary to cut away a portion of the underframe in order to accommodate the operating mechanism of the slide-out unit. This impairs the ability of the underframe to support the vehicle by lessening the strength and rigidity of the underframe.

SUMMARY

The embodiments described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

The following figures are included to illustrate certain aspects of the present disclosure, and should not be viewed as exclusive embodiments. The subject matter disclosed is capable of considerable modifications, alterations, combinations, and equivalents in form and function, without departing from the scope of this disclosure.

FIG. **1** is an isometric side view of an exemplary recreational vehicle having a slide-out unit in accordance with the present disclosure where the slide-out unit is in the retracted position.

FIG. **2** is an isometric side view of the exemplary recreational vehicle of FIG. **1**, illustrating the slide-out unit in the extended position.

FIG. **3** is an isolated isometric top view of the exemplary slide-out unit of FIG. **2**, illustrating the slide-out unit forming a room extension when in the extended position.

FIG. **4** is an isometric side view illustrating certain aspects of an exemplary slide-out drive assembly, according to one or more embodiments.

FIG. **5**A is a close up isometric view of a first area identified as area X in FIG. **4**.

FIG. **5**B is a close up isometric view of a second area identified as area Y in FIG. **4**.

FIG. **5**C is a close up isometric view of a third area identified as area Z in FIG. **4**.

FIGS. **6**A-**6**C illustrate side views of the slide-out drive assembly of FIG. **4** as it articulates a slide-out room from the retracted position to the extended position.

FIGS. **7**A-**7**H illustrate various views of the slide-out drive assembly of FIG. **4** arranged within an exemplary jamb member according to one or more embodiments.

FIGS. **8**A-**8**H are detailed views of the drive chain assemblies utilized with the slide-out drive assembly of FIG. **4**, according to one or more embodiments.

FIG. **9** illustrates a pair of mounting brackets utilized to attach the drive chain assemblies of FIGS. **8**A-**8**E to a slide-out unit, according to one or more embodiments.

FIGS. **10**A-**10**C illustrate alternate embodiments of the slide-out drive assembly of FIG. **4**.

FIGS. **11**A-**11**B illustrate alternate embodiments of the slide-out drive assembly of FIG. **4** utilizing multiple motors.

FIGS. **12**A-**12**C illustrate alternate embodiments of the slide-out drive assembly of FIG. **4** that include drive extension assemblies, according to one or more embodiments.

FIGS. **13**A-**13**B illustrate alternate embodiments of the slide-out drive assembly of FIG. **4** that include timing shafts, according to one or more embodiments.

FIG. **14** illustrates a slide-out drive assembly configured to articulate the slide-out room between a retracted and extended position via a plurality of drive cables, according to one or more embodiments.

FIG. **15**A illustrates an exemplary jamb assembly of FIG. **14** wherein the drive cables are actuated via a drive chain, according to one or more embodiments.

FIG. **15**B illustrates a close up of an upper end of the jamb assembly of FIG. **15**A.

FIG. **15**C illustrates a close up of a lower end of the jamb assembly of FIG. **15**A.

FIG. **15**D illustrates a close up of a middle portion of the jamb assembly of FIG. **15**A.

FIG. **16** illustrates an exemplary jamb assembly of FIG. **14** wherein a screw drive assembly actuates the drive cables, according to one or more embodiments.

FIG. **17**A illustrates a close up of an upper end of the jamb assembly of FIG. **16**.

FIG. **17**B illustrates a close up of a lower end of the jamb assembly of FIG. **16**.

FIG. **17**C illustrates a close up of a middle portion of the jamb assembly of FIG. **16**.

FIG. **18**A illustrates an exemplary routing of drive cables that may be utilized with the jamb assembly of FIG. **16**.

FIG. **18**B illustrates an exemplary drive nut that may be utilized to organize the routing of drive cables illustrated in FIG. **18**A.

FIG. **19** illustrates another exemplary jamb assembly of FIG. **14** wherein a screw drive assembly actuates the drive cables, according to one or more embodiments.

FIG. **20**A illustrates a close up of an upper end of the jamb assembly of FIG. **19**.

FIG. **20**B illustrates a close up of a lower end of the jamb assembly of FIG. **19**.

FIG. **20**C illustrates a close up of a middle portion of the jamb assembly of FIG. **19**.

FIG. **21**A illustrates an exemplary routing of drive cables that may be utilized with the jamb assembly of FIG. **19**.

FIG. **21**B illustrates an upper side of an exemplary drive nut that may be utilized to organize the routing of drive cables illustrated in FIG. **21**A.

FIG. **21**C illustrates the lower side of the drive nut of FIG. **21**B.

FIG. **22** illustrates an exemplary tracking roller assembly that may be utilized with any of the foregoing jamb assemblies to evenly guide the slide-out room between the left and right jamb assemblies and maintain the slide-out room centered within the opening of the vehicle.

FIG. **23** illustrates an alternate screw drive assembly configured to actuate the drive cables to extend or retract the slide-out room from a vehicle, according to one or more embodiments.

FIG. **24** illustrates a drive nut and drive cables of the screw drive assembly of FIG. **23**, according to one or more embodiments.

FIG. **25** illustrates a block and tackle drive assembly configured to articulate the slide-out room, according to one or more embodiments.

FIG. **26** illustrates a close up of one of the block and tackle assemblies of FIG. **25**.

FIG. **27** illustrates a close up of the moving blocks and drive chain of FIG. **26**.

FIGS. **28**A-**28**C illustrate a cable drive assembly that may be incorporated with the jamb assemblies to move the slide-out room between an extended and retracted position.

FIGS. **29**A-**29**C illustrate an alternate cable drive assembly that may be incorporated with the jamb assemblies to move the slide-out room between an extended and retracted position.

FIGS. **30**A-**30**G, FIGS. **31**A-**31**D, FIGS. **32**A-**32**B, FIGS. **33**A-**33**B, FIGS. **34**A-**34**C, and FIGS. **35**A-**35**C illustrate various means for adjusting tension in the drive chain and/or drive cables.

DETAILED DESCRIPTION

The present disclosure is related to slidable unit assemblies and, more particularly, to drive mechanisms for slide-out rooms and slide-out compartments for vehicles.

The embodiments described herein provide a slide-out unit (i.e., a slide-out room, a slide-out compartment, etc.) having a pair of synchronized drive mechanisms that are installed at opposing sides or walls of the room and each configured to drive the room at a top and a bottom corner thereof relative to the vehicle. In some embodiments, these synchronized drive mechanisms each include a jamb that houses a sprocket that drives a drive chain that is attached to a side of the slide-out unit. Other embodiments described herein provide a pair of synchronized drive mechanisms that utilize one or more gears and corresponding racks instead of the foregoing sprockets and corresponding drive chains. In even other embodiments described herein, a pair of synchronized drive mechanisms each include a jamb with a pair of sprockets provided therein, where a timing belt is arranged on the pair of sprockets within the jamb, and a plurality of drive cables are connected to the timing belt and extend from the jamb to connect to the room.

FIGS. **1-3** illustrate an example vehicle **10** that may incorporate the principles of the present disclosure. The depicted vehicle **10** is just one exemplary vehicle that may incorporate the principles of the present disclosure. Indeed, many alternative designs and configurations of the vehicle **10** may be employed without departing from the scope of this disclosure. For example, the vehicle **10** may be a motor home, a fifth wheel trailer, a travel trailer, a utility trailer, or various other types of recreational or non-recreational vehicles. In addition, the vehicle **10** may be one that is designed for living (e.g., as a house trailer) or one that may be designed for work (e.g., a mobile office or library). Accordingly, the vehicle **10** may be a self-powered vehicle or may be a trailer that is adapted to be towed, for example, by an automobile or a truck.

As illustrated, the vehicle **10** includes a body **12** and a slide-out room **22** that is configured to slide relative to the body **12** between a retracted position (FIG. **1**) and an extended position (FIGS. **2-3**). The body **12** defines an interior space (not shown) within which the occupants of the vehicle **10** may live and/or work, and this interior space may be expanded via one or more slide-out rooms and/or slide-out compartments, such as the slide-out room **22**. While these figures illustrate the vehicle **10** having a single extendible slide-out room **22**, in other embodiments, it may include more than one extendible slide-out rooms and/or compartments.

The vehicle body **12** may comprise a plurality of exterior walls, for example, a roof (obscured from view), a front wall **14**, a left sidewall **16**, a right sidewall (obscured from view), and a rear wall (obscured from view). Additionally, the interior of the vehicle body **12** also includes a floor (not

shown). Beneath the floor is a conventional frame (not shown) for supporting the vehicle body **12**, and that frame may be either a conventional or a nonconventional frame.

In the illustrated embodiments, the left sidewall **16** includes an opening **18** and a jamb **20**. As illustrated, the jamb **20** extends along the vertical and horizontal edges of the opening **18** and receives the slide-out room **22**. The opening **18** in the left side **16** of the vehicle body **12** may have any number of geometries depending upon the geometry of the slide-out room **22** and, in the illustrated embodiments, the opening **18** is rectangular and has a perimeter that includes horizontal top and bottom edges and vertical side edges. The jamb **20** is illustrated as being a rectangular structure continuously disposed along these edges, however, in other embodiments, the jamb **20** may include discrete jamb portions that each correspond to one or more of the foregoing edges.

As described below, the slide-out room **22** may be provided with an actuation system or drive mechanism that reciprocates it between the retracted and extended positions. In some embodiments, a portion of the drive mechanism is housed within the jamb **20**. As illustrated, for example, the jamb **20** includes a left jamb **20***a* and a right jamb **20***b* that each houses a portion of the drive mechanism; however, in other embodiments, the drive mechanisms are differently housed, for example, in the bottom and/or top jamb portions. Thus, drive mechanisms may be provided in any or all of the left jamb **20***a*, the right jamb **20***b*, the bottom jamb, and/or the top jamb.

In some embodiments, the vehicle **10** may further include one or more additional or auxiliary slide-out compartments. As illustrated in FIGS. **1-2**, the body **12** includes a lower portion or skirt **24** that is disposed below the floor of the vehicle **10** and which terminates in a lower edge **26**; and, in such embodiments, slide-out compartments may be arranged within the skirt **24**. Either or both of the left sidewall **16** and/or the right sidewall (obscured from view) may include an opening **28** for receiving an auxiliary slide-out unit and, in the illustrated embodiment, the left sidewall **16** includes a slide-out compartment **30**. As will be appreciated, an actuating system or drive mechanism (not illustrated) is provided for reciprocating the slide-out compartment **30** between extended and retracted positions, and, in some embodiments, such drive mechanism is similar to that utilized to actuate the slide-out room **22**. However, it will be appreciated that the drive mechanism of the slide-out compartment **30** may be smaller and less powerful in embodiments where the slide-out compartment **30** is lighter than the slide-out room **22**. It will also be appreciated that there may be any number of such openings **28** equal to the number of the slide-out compartments **30**, and that the openings **28** may be of any number of geometries depending on the geometry of the slide-out compartment **30**. Moreover, the opening **28** (or any of them) may be located at various locations about the body **12** and, in the illustrated embodiment, the opening **28** is disposed along the lower edge **26** of the left sidewall **16**.

The vehicle **10** may have various arrangements of slide-out rooms and/or compartments. In the illustrated embodiments, for example, the vehicle **10** includes one extendible slide-out room **22** and one extendible slide-out compartment **30**. In other non-illustrated embodiments, the vehicle **10** may include two or more of the slide-out rooms **22** and/or two or more slide-out compartments **30**. However, it will also be appreciated that the vehicle **10** may include one or more slide-out rooms **22** without any slide-out compartments **30**, and vice versa. Regardless of the exact configuration, it will be appreciated that the slide-out rooms and compartments **22**,**30** should always be retracted when the vehicle **10** is in motion. And, when the vehicle **10** is parked or stationary, the slide-out room **22** may be articulated into its extended position (FIGS. **2** and **3**) to afford additional space within the interior of the vehicle **10**. Similarly, the slide-out compartment **30** may be actuated when the vehicle **10** is at rest.

As illustrated, the slide-out room **22** may generally have the same cross-sectional shape as the opening **18** in the vehicle body **12**; and, while the same may be true of the slide-out compartment **30** and the opening **28**, the remainder of this disclosure is made with reference to the slide-out room **22**. In the illustrated embodiments, the slide-out room **22** includes a floor (obscured in figures), a ceiling **32**, a left sidewall **34** and a right sidewall **36** (as viewed from the exterior of the vehicle **10** looking in), and a forward or outside wall **38**. In some embodiments, the slide-out room **22** may include one or more windows arranged on any of the ceiling **32**, the left sidewall **34** and/or the right sidewall **36**, and/or the outside wall **38**. For example, the slide-out room **22** is illustrated as including a left and right window **34'**,**36'** on the left and right sidewalls **34**,**36**, respectively, as well as a front window **38'** on the outside wall **38**. For reference, the four corners of the slide-out room **22** are referenced using letters A, B, C, and D, as shown in FIGS. **1-3**.

As illustrated, the outside wall **38** of the slide-out room **22** is substantially coplanar or flush with (but may be spaced slightly outward from) the left sidewall **16** of the vehicle body **12** when the slide-out room **22** is retracted (FIG. **1**), and is parallel to and spaced outwardly from the left sidewall **16** of the vehicle body **12** when the slide-out room **22** is extended (FIG. **2**). In addition, the right sidewall **36** is disposed in a rearward direction of the vehicle body **12**, and the left sidewall **34** is disposed in a forward direction of the vehicle body **12**. The spacing between the left and right sidewalls **34**,**36** is slightly less than a width of the opening **18** in the vehicle body **12**, which affords enough clearance for sliding movement of the slide-out room **22** while minimizing the intrusion of the elements into the vehicle body **12** such as wind and rain. As will be appreciated, the size of the outside wall **38** may be slightly greater than the size of the opening **18** (with the jamb **20**) in the vehicle body **12** so that the edges of the outside wall **38** overlie the vehicle body **12** as an aid in maintaining an effective seal when the slide-out room **22** is retracted. In addition, one or more seals (not shown) may be provided around the perimeter of the opening **18** in a similar fashion to provide an effective means for sealing the slide-out compartment **30** when retracted within the vehicle body **12**.

In certain embodiments, for example, where manual operation and/or manual servicing is desired, one or more handles **40** may be provided on the front wall of the slide-out room **22**, so that the slide-out room **22** may be opened and closed manually. In at least some of these embodiments, a lock **42** may be provided to selectively secure the slide-out room **22**. Moreover, the lock **42** may be provided in addition to the functioning of the actuation system or drive mechanism (detailed below) to lock the slide-out room **22** in position when it is at rest (whether retracted, extended or in-between). Similarly, the slide-out compartment **30** may be provided with a handle **44** for manual operation and a lock **46**, as detailed with reference to the slide-out room **22**.

In the illustrated embodiments, however, the slide-out room **22** is driven with a slide-out drive assembly that transmits force to the slide-out room **22** resulting in smooth, even actuation of the slide-out room **22** along its predeter-

mined path, with no tendency to twist or bind and with minimum power input. In these embodiments, the slide-out drive assembly transmits force evenly to the opposing left and right sidewalls **34**,**36** of the slide-out room **22**, whereas in other embodiments force may be transmitted to either or both of the ceiling **32** and/or the floor (not shown) of the slide-out room **22**. In even other embodiments, the slide-out drive assembly may transmit force evenly to the opposing left and right sidewalls **34**,**36** and either or both of the ceiling **32** and/or the floor of the slide-out room **22**.

One example drive assembly is illustrated in FIG. **4**, and this exemplary slide-out drive assembly generally includes drive mechanism elements (e.g., drive chains and drive sprockets) and timing mechanism elements (e.g., timing chains, timing sprockets, etc.); however, the drive assembly may be configured differently as hereinafter described with reference to FIGS. **10-13** and/or with reference to FIGS. **14-35**. For example, the drive mechanism elements of the slide-out drive assembly may include pinion and rack gears instead of chains and sprockets, or the drive mechanism elements of the slide-out drive assembly may include drive cables. And, as will be appreciated with reference to FIGS. **7**A-**7**H, these drive mechanism elements and timing mechanism elements are at least partially arrangeable within one or more jambs/housings (not illustrated in FIGS. **4-6**) that are secured to the vehicle body **12**, for example, the interior of the left and right jambs **20***a,b* that are secured to the left sidewall **16**.

FIG. **4** is an isometric side view of an exemplary slide-out drive assembly **402** according to one or more embodiments of the present disclosure. More specifically, FIG. **4** illustrates a right side **402***b* of the exemplary slide-out drive assembly **402** engaging and transmitting force to the right sidewall **36** of the slide-out room **22**, but without the right jamb **20***b* that may be included to house certain components of the slide-out drive assembly **402** and secure the same to the vehicle body **12**. It will be appreciated, however, that a left side slide-out drive assembly **402***a* (not illustrated) may be similarly arranged on the left sidewall **34** of the slide-out room **22** to ensure even and uniform actuation along the opposing left and right sidewalls **34**,**36** of the slide-out room **22**.

As illustrated in FIG. **4**, the right side slide-out drive assembly **402***b* includes a pair of drive members configured as a pair of drive chain assemblies **404**,**406** that are installed at vertically spaced locations along the right sidewall **36** of the slide-out room **22**. The drive chain assembly **404** is installed along a lower portion of the slide-out room **22**, between the outside wall **38** and a rear frame **408** of the slide-out room **22**, and is engaged or driven as illustrated in FIG. **5**A. Accordingly, the drive chain assembly **404** is said to correspond with corner D of the slide-out room **22**, and the length that the drive chain assembly **404** extends (together with the other drive chain assemblies) generally defines the amount of extension that a slide-out unit may exhibit in a particular application. The drive chain assembly **404** is engaged or driven at a first area X (which has been enlarged in FIG. **5**A). The drive chain assembly **406** is similarly arranged, except that it is installed along an upper portion of the right sidewall **36** (between the outside wall **38** and the rear frame **408**) and is thus said to correspond with the corner B of the slide-out room **22**. Thus, the drive chain assembly **406** is engaged or driven at a second area Y (which has been enlarged in FIG. **5**B). In addition, FIG. **4** shows the drive chain assemblies **404**,**406** being constrained or slidingly attached to the right sidewall **36**, for example, as illustrated with the drive chain assembly **404** being attached thereto to a third area Z (which has been enlarged in FIG. **5**C). It will be appreciated that the drive chain assembly **406** may be similarly configured as illustrated with respect to the drive chain assembly **404** in FIG. **5**C. And, while not illustrated, it will be appreciated that the left side slide-out drive assembly **402***a* may include similarly arranged drive chain assemblies disposed along the left sidewall **34** so as to correspond with the corners C,A of the slide-out room **22**. The drive chain assemblies, such as the drive chain assemblies **404**,**406**, are further described below, for example, with reference to FIGS. **8**A-**8**H.

As illustrated in FIGS. **5**A-**5**B, the right side slide-out drive assembly **402***b* includes a pair of drive chain sprockets **410**,**412** that engage the drive chain assemblies **404**,**406**, respectively. Here, the drive chain sprocket **410** is a lower drive chain sprocket and the drive chain sprocket **412** is an upper drive train sprocket. More specifically, the drive chain sprocket **410** engages a lower drive chain (obscured; see, for example, FIGS. **8**A and **8**C) that is set within a channel member **414** of the (lower) drive chain assembly **404**, whereas the drive chain sprocket **412** engages an upper drive chain (obscured; see, for example, FIGS. **8**A and **8**C) that is set within a channel member **416** of the (upper) drive chain assembly **406**. It will be appreciated that, as the drive chain sprockets **410**,**412** may each engage their respective drive chain (not shown) from beneath, the channel members **414**,**416** may be supported from above by a respective roller member **418** extending from a roller shaft **420**. In particular, FIG. **5**A illustrates the engagement of the drive chain assembly **404** between the drive chain sprocket **410** and the first roller member **418**, and FIG. **5**B illustrates the engagement of the second drive chain assembly **406** between the second drive chain sprocket **412** and the second roller member **418**. Where utilized, either or both of the roller members may be connected to the drive chain assemblies **404**,**406**, for example, via their respective roller shaft **420**.

As illustrated in FIG. **5**A, the drive chain sprocket **410** is disposed on a drive shaft **422** that is actuated by a motor **424** such that the drive chain sprocket **410** rotates with the drive shaft **422**. In the illustrated embodiment, a gear box **426** is utilized to transfer power (i.e., torque) from an output shaft (not shown) of the motor **424** to the drive shaft **422** that rotates the drive chain sprocket **410**. In this example, the gear box **426** is a worm gear box; however, it will be appreciated that other gear boxes may be utilized, for example, bevel gear boxes. In addition, while various types of actuators or motors may be utilized, in at least some embodiments, the motor **424** is either a self-locking worm drive or a planetary gear motor with an electric brake. Also in the illustrated embodiment, each side **402***a,b* of the slide-out drive assembly **402** includes an actuator, such as the motor **424**. In such embodiments that utilize more than one actuator or motor, the actuators or motors may be synchronized with each other to ensure even and uniform articulation at all sides/corners of the slide-out room **22**, for example, using Hall Effect sensors (not illustrated) that may be arranged to count revolutions of the motor **424**.

The actuators such as the motors **424**, or any of them, may be powered by the vehicle, include a battery (e.g., a rechargeable battery), or be connected to a renewable power source such as a solar powered generator, a vehicle mounted wind turbine generator, etc. Alternatively, a portable motor or a hand crank may be used instead of the motor **424** and/or gear box **426**. Whatever form of power input is used, however, the slide-out room **22** may be locked in position when it is not in motion. When used, a worm drive performs a locking function when the slide-out room **22** is at rest,

locking the slide-out room **22** in place (for example, in a closed position when fully retracted), so that a separate lock is not necessary. With other drive mechanisms, a locking means (e.g., a cam lock, or clamp in the walls of slide-out unit **22**) may be used to retain the slide-out room **22** in position.

A timing sprocket (obscured from view behind the gear box **426**) may be provided on the drive shaft **422** such that the timing sprocket rotates with the drive chain sprocket **410** and the drive shaft **422** (at corner D of the slide-out room **22**). Here, the timing sprocket interposes the drive chain sprocket **410** and the gear box **426**, and receives a timing chain or timing belt **428**. A timing sprocket may be utilized, for example, in embodiments where the right side slide-out drive assembly **402***b* includes a single actuator, such as the motor **424**, such that the motor **424** may be utilized to drive the (lower and upper) drive chain assemblies **404**,**406** together and in unison (i.e., to "time" the drive chain assemblies **404**,**406** so that they are driven simultaneously).

As illustrated in FIG. **5**B, the drive chain sprocket **412** is similarly disposed on a drive shaft **430** (corresponding to corner B) so that the drive chain sprocket **412** rotates with the drive shaft **430**. In addition, a timing sprocket **432** is also similarly disposed on the drive shaft **430** to rotate with the drive chain sprocket **412** and to receive the timing belt **428**, and the timing sprocket **432** may be secured thereon at a location that corresponds with the location of the timing sprocket (obscured from view) on the drive shaft **422** as described with reference to FIG. **5**A. Accordingly, the timing belt **428** couples the (first) drive shaft **422** to the (second) drive shaft **430** such that a rotation of the (first) drive shaft **422** rotates the (second) drive shaft **430**, and vice versa. As will be explained in more detail below, the motor **424**, the timing belt **428**, portions of the drive shafts **422**,**430**, and portions of the roller shafts **420** may be arranged within a structure, such as the jamb **20**, so that the drive chain sprockets **410**,**412** and the roller members **418** protrude therefrom to engage the drive chain assemblies **404**,**406** as illustrated in FIGS. **5**A and **5**B.

The timing belt **428** synchronizes rotation of the lower and upper drive shafts **422**,**430** such that the lower and upper drive sprockets **410**,**412** engage the lower and upper drive chain assemblies **404**,**406**, respectively, in unison. It will be appreciated, however, that the forgoing timing mechanisms are optional, and that each of the drive chain assemblies **404**,**406** could be driven by a discrete motor, which may be synchronized (e.g., a lower and an upper motor that are synchronized with each other via a Hall Effect sensor or feedback). In other embodiments, it will be appreciated that the slide-out drive assembly **402** may instead drive the slide-out room **22** without any timing components, for example, at a single side, a pair or more of sides, or at a pair or more of corners (e.g., at the corners C and D of the slide-out room **22**). In even other embodiments, a timing shaft and a set of bevel gears operatively connected thereto may be utilized in lieu of the foregoing timing components (e.g., the timing belt **428** and the timing sprockets **432**).

FIG. **5**C illustrates how the drive chain assembly **404** may be secured to the right sidewall **36** of the slide-out room **22** according to one or more embodiments. While only illustrating the (lower) drive chain assembly **404**, it will be appreciated that the same may similarly apply with regard to the (upper) drive chain assembly **406** or other drive chain assemblies that may be installed on the left sidewall **34** or elsewhere about the slide-out room **22**. In the illustrated embodiment, a support bracket or bracket **450** is utilized to secure an end of the drive chain assembly **404** that is proximate to the rear frame **408** of the slide-out room **22**. When installed on the slide-out room **22** (e.g., on the right sidewall **36**) over the channel member **414**, the bracket **450** defines an interior space or channel **452** having a vertical dimension "H" (i.e., a height) that is greater than a vertical dimension "h" of the channel member **414**, which is being bracketed against the vehicle body **12** via the bracket **450**. This arrangement permits relative movement of the channel member **414** within the bracket **450**, for example, when the slide-out room **22** is extended and/or "dropped" as described below.

As illustrated in FIGS. **6**A-**6**C, the slide-out drive assembly **402** actuates the slide-out room **22** from a fully retracted position (FIG. **6**A), along a predetermined path (an intermediate position of the predetermined path is illustrated in FIG. **6**B), and to a fully extended position (FIG. **6**C). When the slide-out unit **22** is fully retracted within the vehicle **10**, as illustrated in FIG. **6**A, it rides up above an interior floor **460** of the vehicle **10**. The interior floor **460** of the vehicle **10** may include a slide-out extension slot **462** leading inwardly from the opening **18** and into a lip **464** of the interior floor **460**, and the slide-out room **22** sits on the lip **462** when retracted within the vehicle **10** and slides upon the lip **462** as it extends outward from the opening **18** of the vehicle **10**. The slide-out room **22** includes a floor **466** and, in this embodiment, the floor **466** includes a lip engagement member **468** that extends beyond the rear frame **408** of the slide-out room **22**. Here, the lip engagement member **468** has an upwardly inclined/sloped face **470** that engages a mating surface **472** of the lip **462** and, as will be appreciated, this facilitates providing the slide-out room **22** in a fully extended position where its interior floors (not shown) are substantially coplanar with the interior floors (not shown) of the vehicle **10**. In addition, the sloped face **470** of the engagement member **468** facilitates the engagement member **468** riding along and over the mating surface **472** of the lip **462**, for example, when the slide-out room **22** is articulated from a fully extended position to a retracted position. It will all be appreciated that all of the forgoing contact surfaces, for example, of the lip **462**, the engagement member **468** and its sloped face **470** may all have lubricious contact surfaces (or other low friction surface finishes) that facilitate smooth articulation.

During operation, securing the drive chain assembly **404** to the slide-out room **22** with the bracket **450** (that permits relative motion as previously described) facilitates the slide-out room **22** to "drop" into the extended position illustrated in FIG. **6**C. For example, the floor **466** of the slide-out room **22** travels along the lip **464** until the lip engagement member **468** guides the slide-out room **22** downward along its sloped face **470** that interacts with the mating surface **472** of the lip **464** on the interior floor **460** of the vehicle **10**. In this example, when the slide-out room **22** is in the fully extended position (FIG. **6**C), the sloped face **470** of the lip engagement member **468** is fully engaged with the mating surface **472** of the lip **464**. The bracket **450** permits relative motion between the slide-out room **22** and slide-out drive assembly **402** that is secured to the vehicle body **12** such that the drive assembly **402** is not damaged when the slide-out room **22** "drops" into its extended position (i.e., when the slide-out room **22** moves vertically relative to the remainder of the vehicle body **12**). In this manner, as the slide-out room **22** is fully extended from the vehicle, the sloped face **470** of the lip engagement member **468** rides over and down past the lip **464** such that the interior floor (not shown) of the slide-out room **22** is substantially coplanar with the interior floor (not shown) of the vehicle **10**.

As previously mentioned, aspects of the slide-out drive assembly **402** may be provided within a jamb structure that is secured to the vehicle body **12**. FIGS. **7**A-**7**H illustrate portions of the right side slide-out drive assembly **402***b* arranged within the right jamb **20***b* according to one or more embodiments. In such embodiments, it will be appreciated that the left jamb **20***a* (and/or any other jamb structure(s) disposed around the opening **18**) may be similarly arranged. The right jamb **20***b* includes a jamb member **702**. In the illustrated embodiment, the jamb member **702** is an elongated extrusion having a lower end **704** (corresponding to the corner D) and an upper end **706** (corresponding to the corner B). The jamb member **702** includes a web portion **708** and a pair of legs **710**,**712** extending from a bottom side of the web portion **708** such that the jamb member **702** has a "C" shape cross-section and defines an interior channel **714**, and the interior channel **714** may be utilized to both connect the right jamb **20***b* to the vehicle body **12** and/or to house at least some (or a portion of some) of the right side slide-out drive assembly **402***b* components as described below. In the illustrated embodiment, the second leg **712** is shorter than the first leg **710** of the jamb member **702** due to the manner in which the right jamb **20***b* is secured to the vehicle body **12** via a jamb clamp **730**. However, the jamb member **702** may be differently dimensioned or configured depending on the vehicle **10** to which it is to be attached.

In the illustrated embodiments, a pair of channel frames **720**,**722** are provided within the channel **714** at the lower and upper ends **704**,**706** of the jamb member **702**, respectively. It will be appreciated that while the channel frames **720**,**722** were not depicted in FIGS. **5**A-**5**B, respectively, structures such as the channel frames **720**,**722** may be utilized to position and/or secure the drive shafts **422**,**430**, roller shafts **420**, and/or the motor **424**, and/or other components relative to the drive chain assemblies **404**,**406**.

Here, each of the channel frames **720**,**722** is illustrated as being open rectangular cross-section members each having a rear face **724** and a front face **726**. In some embodiments, the channel frames **720**,**722** are disposed within the channel **714** so that each face **724**,**726** is contained within the envelope defined by the jamb member **702**. In other embodiments, the web portion **708** is formed with a recess **728** sized to receive the front face **726** as best shown in FIGS. **7**F-**7**H. However, either or both of the channel frames **720**,**722** may instead be single frame members spanning approximately parallel to the web portion **708**, or instead be "C" shaped cross-section members that are oriented within the channel **714** such that the "C" shape cross-section of the channel frames **720**,**722** is 180 degrees opposite of the "C" shaped cross-section of the jamb member **702**; and, in this manner, the channels **720**,**722** will not be nested within the jamb member **702**. Rather, the channels **720**,**722** each include a rear face **724** that together define a rear boundary of the channel **714**. Alternatively, the channel frames **720**,**722** may be a planar member similarly disposed within the channel **714** as the foregoing "C" shaped cross-section members.

The jamb clamp **730** may be provided to secure the jamb member **702**, for example, to the vehicle body **12**. In the illustrated embodiment, the jamb clamp **730** includes a first flange **732** that is arranged to correspond with (or nest within) a mating recess of the second leg **712** (of the jamb member **702**); a web portion **734** that extends from the first flange **732** in a substantially coplanar orientation relative to the web portion **708** (of the jamb member **702**); and a second flange **736** that extends from the web portion **734** in a substantially coplanar orientation relative to the first leg **710** (of the jamb member **702**). As will be appreciated, the first flange **732** of the jamb clamp **730** may be secured to the first leg **710** of the jamb member **702** via a friction press-fit as illustrated; however, it may be differently secured or include additional securing methods such as, for example, by use of welding, fasteners, adhesives, etc. Accordingly, the jamb clamp **730** may be utilized to wedge or clamp a portion of the vehicle body **12** within the jamb **20**.

Either or both of the channel frames **720**,**722** within jamb member **702** may have an upper and/or lower aperture (both obscured from view) that extend through the rear and front faces **724**,**726** thereof. FIG. **7**F illustrates an example where these apertures formed into the rear faces **724** of the (lower and upper) channel frames **720**,**722**; whereas FIG. **7**G illustrates these apertures formed into the front faces **726** of the same. As will be appreciated, these apertures are arranged to receive one of the drive shafts **422**,**430** and/or the roller shafts **420**. In other embodiments, however, the drive shafts **422**,**430** and/or the roller shafts **420** extend from the right sidewall **36** of the slide-out room **22** rather than jamb assembly as previously described. In other embodiments, the channel frames **720**,**722** are arranged to receive only the drive shafts **422**,**430**, and the roller shafts **420** are secured to the jamb **20**, for example, at the web portion **708**.

In the illustrated embodiment, the (lower) channel frame **720** includes an aperture that receives the drive shaft **422**. In some embodiments, the channel frame **720** includes a second aperture that receives the roller shaft **420**. Regardless, it will be appreciated that a rear end of each of the roller shaft **420** and the drive shaft **422** may extend to or beyond the rear face **724**, and a front end of each of the roller shaft **420** and the drive shaft **422** extends beyond the front face **726** and outward of the web portion **708** to receive the roller member **418** and the drive chain sprocket **410**. With this arrangement, the (lower) drive chain assembly **404** is secured between the (lower) roller member **418** and the (lower) drive chain sprocket **410** when driven via the (lower) drive chain sprocket **410**. Also in this embodiment, the timing sprocket (not illustrated) on the (lower) drive shaft **422** that engages the timing belt **428** is disposed between the rear and front faces **724**,**726**. In addition, the motor **424** and gear box **426** may be similarly disposed between the rear and front faces **724**,**726**, or may instead be disposed proximate to an outside of the rear face **724**. Also, additional sprockets or gears may be provided on the (lower) drive shaft **422**, for example, an extra sprocket **434** that may be utilized to engage a drive extension assembly as detailed below.

Similarly, the (upper) channel frame **722** may also include one or more apertures to receive the drive shaft **430** and/or the roller shaft **420** as previously described with reference to the (lower) channel frame **720**. Thus, a rear end of each of the roller shaft **420** and the drive shaft **430** may extend to or beyond the rear face **724**, and a front end of each of the roller shaft **420** and the drive shaft **430** extends beyond the front face **726** and outward of the web portion **708** to receive the roller member **418** and the drive chain sprocket **412**. As such, the (upper) drive chain assembly **406** may be secured between the (upper) roller member **418** and the (upper) drive chain sprocket **412** when driven via the (upper) drive chain sprocket **412**. Also in this embodiment, the timing sprocket **432** on the (upper) drive shaft **430** that engages the timing belt **428** is disposed between the rear and front faces **724**,**726**. Also, additional sprockets or gears may be provided on the (upper) drive shaft **430**, for example, the extra (third) sprocket **434** may be utilized to engage an upper motor and/or a drive extension assembly as detailed below.

Turning to FIGS. **8**A-**8**F, various views of the drive chain assemblies **404**,**406** are illustrated according to one or more

embodiments of the present disclosure. However, for ease of discussion, the drive chain assemblies **404**,**406** are each individually referred to as a drive chain assembly **802**. FIG. **8**A is an isometric side view of the drive chain assembly **802**. Here, the drive chain assembly **802** includes a channel member **804** (that is arranged similarly to the channel members **414**,**416** described with reference to FIGS. **5**A-**5**B) and a chain **806**. The channel member **804** may be an elongated extruded piece in some embodiment. While various designs or types of the chain **806** may be utilized, the chain **806** may include a plurality of connected links that are suitably arranged to engage the drive chain sprockets **410**, **412**, as described above. And, in some embodiments, the chain **806** is a standard size roller chain as categorized by the American National Standards Institute (ANSI), for example, roller chain standard 40, 50, 60, or 80.

FIG. **8**B is a front view of the channel member **804** of FIG. **8**A without the chain **806** mounted therein, whereas FIG. **8**C illustrates the channel member **804** of FIG. **8**B with the chain **806** installed therein. As illustrated, the channel member **804** includes a pair of sidewalls **808**,**810** that extend from a web portion **812** of the channel member **804**, and a chain rail **814** arranged between the sidewalls **808**,**810** in a substantially coplanar orientation relative to the web portion **812** of the channel member **804** such that the sidewalls **808**,**810** extend past the chain rail **814**. The portions of the sidewalls **808**,**810** that extend past the chain rail **814** and the chain rail **814** together define a chain channel **816**. In addition, the sidewalls **808**,**810** and the chain rail **814** also define an inner recess or inner channel **818**. As illustrated, the chain channel **816** is arranged to receive the chain **806** and secure it within the channel member **804** such that it may be engaged with a drive chain sprocket such as the drive chain sprockets **410**,**412**, whereas the inner channel **818** is arranged to secure opposing ends of the chain **806** that extend from the chain channel **816**.

FIG. **8**D illustrates a side cut-away view of the drive chain assembly **802** along a section line A-A of FIG. **8**C, according to one or more embodiments. FIG. **8**E illustrates a top view of the drive chain assembly **802** of FIG. **8**A, whereas FIG. **8**F illustrates a bottom view of the drive chain assembly **802** of FIG. **8**A. In the illustrated embodiment, the chain **806** has a length that is longer than the length of the channel member **804** (i.e., longer than the chain rail **814**) such that when the chain **806** is disposed within the chain channel **816**, extra lengths of chain exist and extend out of the chain channel **816** at each end; these extra lengths of chain may then be wrapped around the chain rail **814** into the inner channel where they are secured to the channel member **804**, for example, via a pin **820**. In the illustrated embodiment, a pin **820** is utilized to secure the chain **806** to the channel member **804** at each end thereof by extending (i) through the web portion **812** of the channel member **804**, (ii) through the extra length of chain **806** that is wrapped into the inner channel **818**, (iii) through the chain rail **814**, and (iv) through a portion of the chain **806** disposed within the chain channel **816**. It will be appreciated, however, that other means may be utilized to secure the chain **806** to the channel member **804**. For example, the pin may extend through the web portion **812** and engage the chain **806** within the inner channel **818** with enough pressure such that the chain **806** is secured therein, similar to a press fit.

The channel member **804** may also include a mounting slot **830** at (at least) a first end **832** of the channel member **804**. The mounting slot **830** may be arranged to receive a mounting bracket pin as described below with reference to FIG. **9**. In the illustrated embodiment, however, a second end **834** of the channel member **804** is configured to be attached to the slide-out room **22** via the bracket **450** as described above with reference to FIG. **5**C; however, the second end **834** may be similarly configured as with the first end **832**.

FIGS. **8**G and **8**H illustrate alternate embodiments of the drive chain assembly **802** according to one or more other embodiments. In particular, FIGS. **8**G and **8**H illustrate an embodiment where the chain **806**, or at least a portion of the chain **806**, may extend outward of the chain channel **816** to engage a drive member, such as a drive sprocket **852**, and be held within the chain channel **816** via a pair of chain guides **854**. In the illustrated embodiment, the drive sprocket **852** engages a top side of the chain **806** rather than engaging the underside of the chain **806**, as previously described with reference to FIGS. **8**A-**8**F. Here, either or both of the drive sprockets **410**,**412** may be arranged as the drive sprocket **852** of FIGS. **8**G-**8**H, where the drive sprocket **852** is offset or spaced from the channel member **804** such that its teeth or cogs engage a top side of the chain **806** at a location outside of the chain channel **816**. In these embodiments, the chain **806** rests within the chain channel **816**, but then exits the chain channel **816** to wrap around and engage at least a bottom portion of the drive sprocket **852**. In some embodiments, the drive chain assembly **802** may include one or more chain guides **854** and, in the illustrated embodiments, two such chain guides **854** are provided to maintain the chain **806** within the chain channel **816** when not engaged by the drive sprocket **852**. The chain guides **854**, where utilized, may have various configurations. For example, the chain guides **854** of FIG. **8**G are arranged as rollers, whereas the chain guides **854** of FIG. **8**H are arranged as sprockets. The chain guides **854** may be secured to the drive chain assembly **802** at, for example, the channel member **804** (e.g., at the sidewalls **808**/**810**). Alternatively, the chain guides **854** may be secured to the vehicle body **12**, for example, via the jamb **20** (e.g., connected to the channel member **702**). In even other embodiments, the chain guides **854** are coupled to the motor **424** and arranged to drive (or assist in driving) the slide-out room **22** as described herein; and in such configurations, the chain guides may be timed with the drive sprocket **852**. In addition, one or more roller members **418** may be provided to ensure engagement between the drive sprocket **852** and the drive chain assembly **802** as hereinbefore described, and such roller members **418** may each extend from the roller shaft **420** as previously described.

FIG. **9** illustrates a pair of mounting brackets **842** according to one or more embodiments. The mounting brackets **842** may be utilized to attach the first end **832** (and/or the second end **834**) of the drive chain assembly **802** to the slide-out room **22** as mentioned above. Here, each of the mounting brackets **842** includes a base **844** secured to the slide-out room **22** and a pin **846** extending outwardly therefrom. The base **844** may be attached to the slide-out room **22** via a number of fastening methods, for example, via utilization of fasteners or adhesives. The pin **846** is arranged within the mounting slot **830** such that the channel member **804** is able to rotate about the pin **846** relative to the plate **844** (and the slide-out room **22** secured thereto), thereby permitting the second end **834** to vertically translate within the channel **452** of the bracket **450** as described above with reference to FIG. **5**C. In some embodiments, the pin **846** is made from a lubricious material; however, in other embodiments, a bushing or sleeve may be provided between the pin **846** and the mounting slot **830** to facilitate smooth rotation. Accordingly, in the illustrated embodiment, the first end **832** of the drive assembly **802** is mounted to the slide-out room

22 via pin 846 that permits relative rotation (about the pin 846) between the slide-out room 22 and the vehicle structure 12, whereas the second end 834 of the drive assembly 802 is mounted to the slide-out room 22 via the bracket 450 that permits relative movement between the slide-out room 22 and the vehicle body 12 (in at least a vertical direction).

It will be appreciated that, while not illustrated, the left side slide-out drive assembly 402*a* may be arranged similar to the right side slide-out drive assembly 402*b* as described in FIGS. 4-9.

It will also be appreciated that in certain environments, it may be desirable to protect the drive chain assemblies from dirt, debris, and/or moisture. This may be true in embodiments where the drive chain assemblies are mounted to the ceiling or upper surface of slide-out room 22. To this end, a protective surface (not illustrated) may be utilized to cover vulnerable drive chain assemblies, for example, the chain 806 therein. The protective surface may be a thin membrane or have a suitably configured sleeve that travels along any portion of drive chain assembly, and/or the chain 806 disposed therein, that may be subject to the accumulation of unwanted material. However, it is appropriate that the protective surface not enter the engagement between a drive chain sprocket (e.g., 410,412) and a chain (e.g., the chain 806) in a drive chain assembly (e.g., 404,406). In some embodiments, a router (not illustrated) may be employed to channel the protective surface around such engagement and, in one such embodiment, the router includes a series of traveler members therein that help to move the protective surface away from the sprocket/chain engagement as the slide-out room 22 is moved between retracted and extended positions. Alternatively, the protective surface could be collected and dispensed via an arrangement of one or more spools in which such spools are biased and take up excess slack as the slide-out unit drive assembly actuates.

The slide-out drive assembly 402 may also be modified in a number of ways. For example, the motor 424 may be moved from its position that is proximate to the (lower) drive shaft 422 (as illustrated in FIGS. 4 and 5A) to an upper position proximate to the (upper) drive shaft 430 (as illustrated in FIGS. 10A and 10C), and/or the motor 424 may be inverted so that its cylindrically extending base portion extends upward (as illustrated in FIGS. 10B and 10C) rather than downward (as illustrated in FIGS. 4, 5A and 10A). It will be appreciated that the motor 424 (or any of them, if more than one) may be differently oriented to extend at angles other than those illustrated in the figures, as may be needed in a particular application.

FIG. 10A illustrates the right side of a slide-out drive assembly 1002 according to one or more other embodiments. Here, the motor 424 and gear box 426 are disposed at an upper portion of the right sidewall 36 so as to the (upper) drive shaft 430 instead of the (lower) drive shaft 422 as illustrated in FIG. 4. Here, the (lower) drive shaft 422 includes a timing sprocket 1004 disposed thereon in a similar manner in which the timing sprocket 432 is disposed on the (upper) drive shaft 430 in FIG. 4.

FIG. 10B illustrates a slide-out drive assembly 1010 according to one or more other embodiments. The slide-out drive assembly 1010 is similar to the slide-out drive assembly 402 illustrated in FIG. 4, except that the motor 424 and the gear box 426 are inverted so that a body of the motor 424 extends upwards as illustrated in FIG. 10B.

FIG. 10C illustrates a slide-out drive assembly 1020 according to one or more other embodiments. The slide-out drive assembly 1020 is similar to the slide-out drive assembly 1002 illustrated in FIG. 10A, except that the motor 424 and the gear box 426 are inverted so that a body of the motor 424 extends upwards in a similar fashion as described with reference to FIG. 10B.

As mentioned above, some embodiments described herein may utilize multiple motors 424. For example, each of the corners A,B,C,D may have an actuator associated therewith as illustrated in the example embodiment of FIGS. 11A-11B. These example embodiments utilize multiple actuators on each side of the slide-out drive assembly, such as a pair of motors 1104. Here, utilizing multiple motors eliminates the need for mechanical timing components (e.g. timing belts, shafts, or bevel gear arrangements) to synchronize or time the upper and lower motors 1104. Instead, the motors 1104 may be synchronized using Hall Effect sensors as detailed above or using logic (e.g., a programmable logic controller). Also, while embodiments described herein illustrate just one or two of the motors, it will be appreciated that in some applications it may be beneficial to utilize two or more motors 424 that are synchronized (or controlled with feedback) to drive either or both of the drive chain assemblies 404,406.

FIG. 11A illustrates a right side slide-out drive assembly 1102 that includes two motors 1104, according to one or more embodiments. Here, each of the motors 1104 includes a gear box 1106 integrally attached and extending from a base 1108 of the motor 1104. As will be appreciated, the gear box 1106 is arranged to transfer a rotation force (torque) to a shaft such as the drive shafts 422,430. It will be appreciated that in some applications it may be beneficial to utilize two or more motors 424 that are synchronized (or controlled with feedback) to drive either or both of the drive chain assemblies 404,406.

FIG. 11B is an alternate embodiment of a right side slide-out drive assembly 1120, according to one or more embodiments. Here, the right side slide-out drive assembly 1120 includes a pair of motors 1130 oriented with their bases extending downward. Each of the motors 1130 includes a bevel gear 1132 extending from a top side of the motor 1130. Each of the bevel gears 1132 is oriented to rotate around a vertical axis (of its corresponding motor 1130) and drives a mating bevel gear 1134 that engages the slide-out room 22 (e.g., at the drive chain assembly 404). One of the mating bevel gears 1134 is disposed on each of the lower and upper drive shafts 422,430, and arranged thereon so that the bevel gears 1134 each rotate with their corresponding one of the drive shafts 422,430. Accordingly, a rotation of the bevel gear 1132 around the vertical axis drives the mating bevel gear 1134 engaged therewith, which in turn causes the corresponding one of the drive shafts 422,430 to rotate. The drive chain sprockets 410,412 rotate with the drive shafts 422,430 and actuate the drive chain assemblies 404,406 that are attached to the right sidewall 36 of the slide-out unit 22.

Also in this embodiment, the drive shafts 422,430 may extend from the right sidewall 36 of the slide-out room 22 rather than jamb assembly as previously described. In addition, a roller 1138 may be provided with a shaft 1140 that similarly secures it to the right sidewall 36 of the slide-out room 22. In these embodiments, it will be appreciated that the first bevel gears 1134 is attached to a portion of the vehicle body 12, for example, via a jamb assembly.

FIG. 12A illustrates an alternate embodiment of a right side slide-out drive assembly 1202, according to one or more embodiments. Here, the right side slide-out drive assembly 1202 is similar to the right side slide-out drive assembly 402*b* of FIG. 4, except that the motor 424 utilizes a gear box 1204 having a first bevel gear 1204 that is arranged to engage and drive a second bevel gear 1206. The second

bevel gear **1206** is arranged on the drive shaft **422** such that they rotate together. Accordingly, the motor **424** transmits rotational force to the (lower) drive shaft **422** via bevel gear arrangement of the bevel gears **1204**,**1206**. Also, the (upper) drive shaft **430** rotates with the (lower) drive shaft **422** via the timing elements such as the timing belt **428**.

FIG. **12**B illustrates an alternate embodiment of a right side slide-out drive assembly **1212**, according to one or more embodiments. Here, the right side slide-out drive assembly **1212** is similar to the right side slide-out drive assembly **1202** of FIG. **12**A, except that the present right side slide-out drive assembly **1212** includes a drive extension assembly **1214** that permits the motor **424** and the bevel gear box **1204'** attached thereto to be located further away from the drive shafts **422**,**430**. Here, the drive extension assembly **1214** includes a bevel drive gear **1216** disposed proximate to the bevel gear box **1204'** so as to be engaged and driven thereby. The bevel drive gear **1216** is secured within a jamb structure (not illustrated) but in other embodiments may be secured to the sidewall **36** of the slide-out room **22**. The drive extension assembly **1214** also includes an extension drive chain **1218** that couples the bevel drive gear **1216** to the (lower) drive shaft **422** so that they rotate with each other in unison. Thus, the drive chain **1218** wraps around an extension drive sprocket **1220** that is attached to (and rotates with) the bevel drive gear **1216**, and also wraps around a corresponding sprocket **1222** that is disposed on the (lower) drive shaft **422** at a location thereon proximate to the drive chain sprocket **410**. As such, the drive shaft **422** includes a pair of sprockets (i.e., the drive chain sprocket **410** and the sprocket **1222**) and is thus sometimes referred to as a double sprocket configuration.

FIG. **12**C illustrates an alternate embodiment of a right side slide-out drive assembly **1232**, according to one or more embodiments. Here, the right side slide-out drive assembly **1232** is similar to the right side slide-out drive assembly **1212** of FIG. **12**B, except that the motor **424** and the bevel gear box **1204'** are instead oriented along the (upper) drive chain assembly **406** rather than along the (lower) drive chain assembly **404** as illustrated in FIG. **12**B. Thus, the (upper) drive shaft **430** has the double-sprocket configuration in this embodiment because both the drive chain sprocket **412** and the sprocket **1222** that corresponds with the extension drive sprocket **1220** are disposed thereon.

In other embodiments, timing elements are utilized other than belts and chains. FIGS. **13**A-**13**B, for example, each illustrate an alternate embodiment of a right side slide-out drive assembly **1302**A,B that utilize a timing shaft **1304** rather than a belt or chain such as the timing belt **428**, according to one or more embodiments. Here, the timing shaft **1304** is operatively connected to the motor **1306**. Also disposed on the timing shaft **1304** are a pair of bevel gears **1310**,**1312** that rotate with the timing shaft **1304**. The bevel gears **1310**,**1312** are disposed at opposing ends of the timing shaft **1304**, for example, at locations thereon that correspond with the drive chain assemblies **404**,**406**. Here, the roller members **418** and the drive shafts **422**,**430** are secured directly into the right sidewall **36** of the right hand slide-out room assembly **1302**A. In addition, each of the drive shafts **422**,**430** include a bevel gear **1314**,**1316** arranged thereon such that the bevel gear **1314** rotates with the (lower) drive shaft **422** and the bevel gear **1316** rotates with the (upper) drive shaft **430**. The drive shafts **422**,**430** are disposed proximate to the drive chain assemblies **404**,**406**, such that the motor **1306** rotates the timing shaft **1304**, which in turn causes the pair of bevel gears **1310**,**1312** attached thereto to rotate with the timing shaft **1304**; and each of the pair of bevel gears **1310**,**1312** engages and rotates its corresponding one of the bevel gears **1314**,**1316** such that the drive shafts **422**,**430** attached thereto rotate.

As illustrated in the example embodiment of FIG. **13**A, the motor **1306** and the first bevel gear **1310** are disposed on the timing shaft **1304** proximate to the (lower) drive chain assembly **404** and the second bevel gear **1312** is disposed on the timing shaft **1304** proximate to the (upper) drive chain assembly **406**. Similarly in the example embodiment illustrated in FIG. **13**B, the motor **1306** and the first bevel gear **1310** are disposed on the timing shaft **1304** proximate to the (upper) drive chain assembly **406** and the second bevel gear **1312** is disposed on the timing shaft **1304** proximate to the (lower) drive chain assembly **404**.

In these embodiments, a bushing **1320** and bushing bracket **1322** may be arranged on the timing shaft **1304** at locations thereon proximate to the first and second bevel gears **1310**,**1312** as a means of maintaining and/or securing the timing shaft **1304** in a position such that the bevel gear **1310** engages the bevel gear **1314** and so that the bevel gear **1312** engages the bevel gear **1316**. The bushing **1320** may be secured to the timing shaft **1304** via a pin **1324** so that it rotates with the timing shaft **1304** within an aperture arranged to rotatably receive the timing shaft **1304**. In some embodiments, the timing shaft **1304** is secured within a jamb assembly as previously described utilizing one or more of the busing brackets and, in such embodiments, the motor **1306** may also be provided on the same jamb assembly or elsewhere on the vehicle body **12**.

An exemplary operation of an apparatus according to one embodiment of this disclosure will now be described with reference to FIG. **4**, FIGS. **5**A-**5**C, and FIGS. **6**A-**6**C. When it is desired to move the slide-out room **22** from a first or retracted position as shown in FIG. **1** to a second or extended position as shown in FIG. **2**, the actuator (e.g., the motor **424**) is started, for example, by means of a switch (not shown), and is caused to turn in one direction. The motor **424** drives the drive shaft **422**, which in turn causes the drive sprocket **410** to rotate. The timing belt **428** couples the (lower) drive shaft **422** to the (upper) drive shaft **430**, so that they are "timed" and the (upper) drive shaft **430** rotates in unison with the (lower) drive shaft **422**; and rotation of the (upper) drive shaft **430** in turn causes the (upper) drive sprocket **412** to rotate therewith. The lower and upper drive sprockets **410**,**412** are respectively engaged with a drive chain assembly **404**,**406** that is attached to the slide-out room **22**. Accordingly, actuation of the motor **424** causes the drive sprockets **410**,**412** to rotate and drive the drive chain assemblies **404**,**406** engaged therewith such that the slide-out room **22** is translated along its path relative to and outward from the vehicle body **12**. In an alternate embodiment (not shown), the motor **424** is not provided and the slide-out room **22** is only manually driven. In other embodiments, the vehicle **10** includes the slide-out compartment **30**, which is driven either manually or via the motor **424** as detailed herein.

Also described herein are various embodiments of jamb mounted slide-out drive assemblies utilizing cables to extend and retract the slide-out room **22** and which may be mounted along the jambs **20** of the opening **18** in the vehicle **10**. FIG. **14** illustrates an exemplary jamb mounted slide-out drive assembly **1400** (hereinafter, the assembly **1400**) configured to articulate the slide-out room **22** between a retracted and extended position via a plurality of drive cables **1402**, according to one or more embodiments. The assembly **1400** is incorporated into the jambs surrounding the slide-out room **22** and may include various different

configurations for actuating the drive cables **1402**. For example, FIGS. **15**A-**15**D illustrate an example of the assembly **1400** configured to actuate the drive cables **1402** via a drive chain **1502**, according to one or more embodiments. As described below, the drive cables **1402** are adjustably connected to the drive chain **1502** that is in engagement with and driven by a motor **1504**, such that actuation of the motor **1504** rotates the drive chain **1502**, which in turn actuates the drive cables **1402**. FIGS. **16-18** illustrate an example of the assembly **1400** configured to actuate the drive cables **1402** via a screw drive **1602**, according to one or more embodiments. As described below, the screw drive **1602** includes a trunnion or drive nut **1604** and a threaded rod or drive shaft **1606** that is rotatable by a motor **1608**. In these examples, the plurality of drive cables **1402** are adjustably connected to the drive nut **1604** that is in threaded engagement with the drive shaft **1606**, such that actuation of the motor **1608** rotates the drive shaft **1606**, thereby driving (or translating) the drive nut **1604** (linearly along the drive shaft **1606**), which in turn actuates the drive cables **1402**. FIGS. **19-21** illustrate yet another example of the assembly **1400** configured to actuate the drive cables **1402** via the screw drive **1602**, according to one or more alternate embodiments. FIGS. **23-24** illustrate yet another example where the drive cables **1402** are actuated via an alternate screw drive assembly, according to one or more alternate embodiments. FIGS. **25-27** illustrate an example where the drive cables **1402** are actuated via a block and tackle drive assembly, according to one or more alternate embodiments. FIGS. **28-29** illustrate an example where a drive chain (e.g., configured as a continuous loop of chain, as a discontinuous segment or strand of chain, etc.) tensions one of the drive cables **1402** (or one cable end of one of the drive cables **1402**) to move the slide-out room **22**, such that the slide-out room **22** simultaneously activates the remaining drive cables **1402** to synchronize movement of the slide-out room **22**, according to one or more alternate embodiments. As more fully described below, any of these configurations for actuating the drive cables **1402** may be incorporated into the jambs surrounding the slide-out room **22** and, therefore, incorporated into the assembly **1400**.

With reference to FIGS. **14-15**, each of the drive cables **1402** includes a first end and a second end, where the first ends of the drive cables **1402** may be secured to the slide-out room **22** via a cable mount **1404** and where the second ends of the drive cables may be coupled to the drive chain **1502**. The length of the drive cables **1402** may be adjusted and, in the illustrated examples, the second ends of the drive cables **1402** are attached to a threaded rod **1406** to facilitate such adjustment as hereinafter described. Thus, the drive cables **1402** may be configured such that their length is adjusted at their second ends. In some examples, the first ends of the drive cables **1402** are also or instead configured to permit adjustment of the length of the drive cables **1402**. For example, the first ends of the drive cables **1402** may include a threaded rod that is adjustable at the cable mount **1404**.

In the illustrated examples, the assembly **1400** includes a pair of jamb assemblies **1410** (each, a jamb assembly **1410**). For example, the pair of jamb assemblies **1410** may include a right jamb assembly **1410***a* and a left jamb assembly **1410***b* that correspond to the right sidewall **36** and the left sidewall **34**, respectively, of the slide-out room **22**. In other embodiments, the pair of jamb assemblies **1410** may be installed at a top and bottom of the opening **18**, such that they correspond with a top side and a bottom side of the slide-out room **22**. Where the pair of jamb assemblies **1410***a*re utilized, they may be similarly configured. In even other embodiments, just one of the jamb assemblies **1410** is provided on one side of the slide-out room **22**, for example, the top jamb assembly **1410**, the bottom jamb assembly **1410**, the right jamb assembly **1410***a*, or the left jamb assembly **1410***b*. In one example, just one of the jamb assemblies **1410** is provided on the bottom side of the slide-out room **22**.

Regardless of how the assembly **1400** is configured to actuate the drive cables **1402**, it may be mounted within the opening **18** in the vehicle body **12** and, in particular, at the jambs **20** arranged about the opening **18**. In the illustrated examples, each of the jamb assemblies **1410** includes a jamb member or frame member **1420** configured to secure the jamb assembly **1410** to the vehicle **20** (e.g., to the sidewall **16** thereof). In addition, the frame member **1420** is configured as a shroud to house the various drive components of the jamb assembly **1410***a*nd thereby protect such drive components. Thus, the frame member **1420** may secure the jamb assembly **1410***a*nd its various internal drive components (detailed below) to the vertical and/or horizontal edges of the opening **18**. Here, the frame members **1420** secure the jam assemblies **1410** to the vertical edges of the opening **18**. The jamb assemblies **1410** may also include one or more additional jamb members or frame members such that the assembly **1400** defines a frame about the slide-out room **22**. Here, for example, jamb assemblies **1410** also includes a bottom frame member **1422** and a top frame member **1424**, such that the frame members **1420** (i.e., of the left and right jamb assemblies **1410***a*,**1410***b*), the bottom frame member **1422**, and the top frame member **1424** together define a square shaped frame surrounding the slide-out room **22**. Also, any or all of the frame members **1420**, the bottom frame member **1422**, and the top frame member **1424** may be configured to form a seal with the slide-out room **22** to inhibit ingression of debris to within the vehicle **10**. In addition, as described below, any or all of the frame members **1420**, the bottom frame member **1422**, and the top frame member **1424** may be configured to guide or track the slide-out room **22** evenly within the opening **18** in the vehicle **10** and/or be configured to cover or house timing mechanisms that synchronize operation of the jamb assemblies **1410***a*,**1410***b*. For example, any or all of the frame members **1420**, the bottom frame member **1422**, and the top frame member **1424** may include a tracking roller assembly as described with reference to FIG. **22**.

Each of the jamb assemblies **1410** may include a motor or actuator, as described below. In some embodiments, just one of the jamb assemblies **1410** includes a motor. The motors may be arranged within the frame member **1420** or exterior of the frame. The frame member **1420** may have various configuration and, in the illustrated examples, the frame member **1420** is an extruded member having a web portion and a pair of opposing sidewalls (or flanges) in the form of a "C" beam.

Regardless of how many motors are utilized and where they are arranged, however, the jamb assemblies **1410** may be "timed" or synchronized such that they operate in unison. Where each of the jamb assemblies **1410** includes a separate motor/actuator, the motors/actuators may be electronically timed via sensors and/or feedback. The jamb assemblies **1410** may also be mechanically "timed" or synchronized via a timing mechanism such as a timing shaft or cross bar **1412**. For example, where each of the jamb assemblies **1410** includes a separate motor/actuator, a mechanical timing mechanism **1430** may be utilized to ensure that the jamb assemblies **1410** operate in unison. Also, where just one of the jamb assemblies **1410** includes a motor, the mechanical timing mechanism **1430** may be utilized to transfer power to

the jamb assembly **1410** without the motor. In some examples, each of the jamb assemblies **1410** includes a separate motor/actuator and the separate motors/actuators are both electronically timed and mechanically timed (e.g., the mechanical timing mechanism **1430**).

In the illustrated example, the mechanical timing mechanism **1430** includes a timing shaft **1432**; however, other timing mechanisms may be utilized in addition to or in lieu thereof, such as a timing belt. Here, the timing shaft **1432** is shrouded by the bottom frame member **1422** and is supported therein via a support **1434**. Thus, in the illustrated example, timing mechanism **1430** is configured within the bottom frame member **1422**; however, the bottom frame member **1422** and/or the support **1434** are optional. In other examples, the timing shaft **1432** may instead be arranged within the top frame member **1424**. In even other examples, both the bottom frame member **1422** and the top frame member **1424** include the timing mechanism **1430**.

FIGS. **15**A-**15**D illustrate one of the jamb assemblies **1410** configured to actuate the drive cables **1402** via the drive chain **1502**, according to one or more embodiments. FIG. **15**A is a side view of the jamb assembly **1410** configured with the drive chain **1502**. FIG. **15**B illustrates a close up of a top end of the jamb assembly **1410** of FIG. **15**A. FIG. **15**C illustrates a close up of a bottom end of the jamb assembly **1400** of FIG. **15**A. FIG. **15**D illustrates a close up of a middle portion of the jamb assembly **1410** of FIG. **15**A.

In the exemplary embodiment of FIGS. **15**A-**15**D, the drive chain **1502**, the motor **1504**, and other drive components of the jamb assembly **1400** are arranged within the frame member **1420**. The frame member **1420**, however, is not illustrated in these figures to facilitate illustration of the drive chain **1502**, the motor **1504**, and the other drive components arranged therein. In these illustrated examples, the jamb assembly **1410** further includes a drive sprocket **1506** and an idler sprocket **1508** that are configured to receive the drive chain **1502**. The motor **1504** is coupled to the drive sprocket **1506** such that the motor **1504** may impart rotation to the drive sprocket **1506**. In addition, the drive sprocket **1506** and the idler sprocket **1508** each include teeth that mesh with the drive chain **1502**. Thus, rotation of the drive sprocket **1506** causes the drive chain **1502** to travel along a predefined path according to the geometry and placement of the drive sprocket **1506** and the idler sprocket **1508**. The drive sprocket **1506** and idler sprocket **1508** may be secured at various locations within the frame member **1420** and, in the illustrated embodiment, the drive sprocket **1506** is secured at a top end of the frame member **1420** and the idler sprocket **1508** is secured at a bottom end of the frame member **1420**. Similarly, the motor **504** may be arranged within the frame member **1420**.

The drive sprocket **1506** is configured to be rotated, and thereby drive the drive chain **1502**. Torque may be imparted to the drive sprocket **1506** via any number of manners. For example, the drive sprocket **1506** may be manually rotated or coupled to an electronically controlled actuator such as the motor **1504** that is configured to impart torque to the drive sprocket **1506**. Accordingly, the motor **1504** may be actuated to rotate the drive chain **1502** in a first or second direction about the drive sprocket **1506** and the idler sprocket **1508**.

The idler sprocket **1508** may be configured with a timing shaft to synchronize operation of the pair of jamb assemblies **1410**. In the illustrated example, the idler sprocket **1508** is coupled to the timing shaft **1432** configured to synchronize the right and left jamb assemblies **1410***a*,**1410***b*. Not only does the timing shaft **1432** time or synchronize operation of the jamb assemblies **1410**, but it facilitates manually overriding one of the jamb assemblies **1410**, as an individual one of the jamb assemblies **1410** (e.g., the right jamb assembly **1410***a*) may be manually manipulated and that action will be communicated to the other one of the jamb assemblies **1410** (e.g., the left jamb assembly **1410***b*) via the timing shaft **1432**. In the illustrated embodiment, the timing shaft **1432** couples the idler sprocket **1508** of the right jamb assembly **1410***a* to the idler sprocket **1508** of the left jamb assembly **1410***b*. Accordingly, the motor **1504** in each of the jamb assemblies **1410** will be timed or synchronized. In other embodiments, the motor **1504** may be provided in only one of the jamb assemblies **1410***a*nd, in these other embodiments, the timing shaft **1432** operates as a drive member for the jamb assembly **1410** without the motor **1504** by transferring torque thereto.

The jamb assemblies **1410** may also be configured with a plurality of guides or pulleys for routing the drive cables **1402** as hereinafter described. In the illustrated embodiment, a top and bottom cable guide **1510**,**1512** are provided and secured at top and bottom ends of the frame member **1420**, respectively. Here, the top and bottom cable guides **1510**, **1512** are configured as double pulleys such that they each may receive a pair of the drive cables **1402** without interfering with each other or causing rubbing or friction between the drive cables **1402**. The top and bottom cable guides **1510**,**1512** may be configured as double pulleys. This means, for example, that the top cable guide **1510** includes a pair of independent pulleys that may rotate relative to each other, or include independent cable tracks, so as to permit a pair of drive cables **1402** to travel therein in opposing direction without interference; and the bottom cable guide **1512** may be similarly configured. Also in this embodiment, a cable idler **1514** is provided proximate to the bottom cable guide **1512** for redirecting the path of any of the drive cables **1402** as hereinafter described; and, where utilized, the cable idler may also be configured as a double pulley, such that it may guide a pair of the drive cables **1402** without interference, rubbing, or friction between the drive cables **1402**.

In the illustrated embodiment, the drive chain **1502** is coupled to the drive cables **1402** and, as the drive chain **1502** is rotated in a first direction D**1** or a second direction D**2** about the drive sprocket **1506** and the idler sprocket **1508**, the drive chain **1502** pulls the drive cables **1402** to extend or retract the slide-out room **22**.

After extended use of the assembly **1400**, the drive cables **1402** may become stretched from their original lengths, and the different drive cables **1402** may be stretched different amounts such that they have different overall lengths, thereby causing misalignment that may inhibit the slide-out room **22** from being fully retracted. For example, the bottom set of drive cables **1402** may be subject to the greatest load of all of the drive cables **1402** and, therefore, the working length thereof may stretch out or expand to a greater degree than the other cables, and this may result in the assembly **1400** becoming misaligned. Thus, the drive cables **1402** may need to be adjusted periodically to ensure that they are of the optimal working length. In the illustrated examples, the drive cables **1402** are adjustably coupled to drive chain **1502** via a pair of cable chain connectors **1520** (hereinafter, individually referred to as the "connector **1520**"). The connector **1520** is configured to couple the drive chain **1502** to one or more drive cables **1402** such that the drive cables **1402** extend or retract from the jamb assembly **1410***a*s the drive chain **1502** rotates.

FIG. **15**D illustrates a close-up view of a first connector and a second connector **1520***a*,**1520**, according to one or

more embodiments. The first and second connectors **1520***a*, **1520***b* may be identically configured or be differently configured with respect to each other. In particular, a first pair of the cables **1402** are adjustably connected to the drive chain **1502** via the first connector **1520***a* and a second pair of the drive cables **1402** are adjustably connected to the drive chain **1502** via the second connector **1520***b*. Thus, two connectors **1520** (i.e., the first and second connectors **1520***a*, **1520***b*) may be utilized to couple the four (4) drive cables **1402** to the drive chain **1502**. However, a single connector **1520** may be utilized to connect the four (4) drive cables **1402** to the drive chain **1502** if two (2) of the drive cables **1402** are re-routed over pulleys or guides.

The connector **1520** is configured to secure to the drive chain **1502** and to secure to an end of the cable **1402** (i.e., the end that is not secured to the slide-out room **22**), such connector **1520** interconnects the drive cables **1402** and the drive chain **1502**. In this manner, the cable **1402** is coupled to the drive chain **1502** such that the cable **1402** will move with the drive chain **1502**. Also, the connector **1520** is configured to be attached to the drive chain **1502** regardless of whether the drive chain **1502** is provided as a closed loop (without any free ends), or whether the drive chain **1502** is open with first and second loose ends, or whether the drive chain **1502** is formed from a pair of open chains that each include a pair of loose ends. Thus, the drive chain **1502** defines an endless loop during operation regardless of how it is provided.

The connectors **1520** are configured to permit adjustment of the drive cables **1402** and the drive chain **1502**. The connector **1520** is configured to permit adjustment of the drive cables **1402**, such that the working length of the drive cables **1402** may be lengthened or shortened as needed in a particular application. As used herein, the term "working length" of a particular one of the drive cables **1402** means the length of the drive cable extending between the cable mount **1404** and the connector **1520**. In the illustrated example, the connectors **1520** each include an adjustment nut **1522** that receives the threaded rod **1406** of the drive cables **1402**. Here, the adjustment nut **1522** may be rotated to move the threaded rod **1406** extending there-through, forward or backward, which in turn will add tension or remove tension from the drive cable **1402** associated therewith. Thus, the working length of the drive cables **1402** may be adjusted by rotating the adjustment nut **1522**.

As mentioned, the connector **1520** may also be configured to permit adjustment of the chain **1502**. In the illustrated example, the drive chain **1502** is comprised of a first and second chain length **1524**,**1526** that each include a first and second loose end. Thus, the first chain length **1524** includes a pair of loose ends **1524***a*,**1524***b* and the second chain length **1526** includes a pair of loose ends **1526***a*,**1526***b*. Here, each of the connectors **1520**,**1520***b* has a first and second chain mounting end **1528***a*,**1528***b*, such that the loose ends **1524***a*,**1524***b* of the first chain length **1524** are secured to the first mounting end **1528***a* of the first connector **1520***a* and the second mounting end **1528***b* of the second connector **1520***b*, receptively, and such that the loose ends **1526***a*, **1526***b* of the second chain length **1526** are secured to the first mounting end **1528***a* of the second connector **1520***b* and the second mounting end **1528***b* of the first connector **1520***a*, respectively. The drive chain **1502** may be secured to the connector **1520** via a variety of manners and, in the illustrated example, the loose ends **1524***a*,**1524***b*,**1526***a*,**1526***b* of the first and second chain lengths **1524**,**1526** are pinned to the first and second mounting ends **1528***a*,**1528***b*, respectively. Either or both of the connectors **1520***a*,**1520***b* may be configured to permit adjustment to the chain lengths **1524**, **1526**. In the illustrated example, the second mounting end **1528***b* of the second connector **1520***b* includes a chain adjustment portion **1530**. Here, the chain adjustment portion **1530** includes a threaded rod **1532** and an adjustment nut **1534**, where rotation of the adjustment nut **1534** will extend or retract the threaded rod **1532**, thereby effectively increasing the length of the chain length **1524** and, thus, the overall length of the drive chain **1502**. The chain adjustment portion **1530** may instead be provided on the first mounting end **1528***a*, or provided on both the first and second mounting ends **1528***a*,**1528***b*; also, the first and/or second mounting ends **1528***a*,**1528***b* of the first connector **1520***a* may similarly be configured with the chain adjustment portion. Thus, just one of the connectors **1520** may have the chain adjustment portion **1530**, or both of the connectors **1520***a*,**1520***b* may have at least one chain adjustment portion **1530**.

As previously mentioned, the drive cables each include a first end where they are attached to an anchor mount **1404** and a second at which they are attached to the connector **1520**. Thus, the drive cables **1402** are coupled to the slide-out room **22** at their first ends and coupled to the vehicle **10** body at their second ends. In the illustrated embodiment, the anchor **1404** is a bracket that is mounted to the sidewall of the slide-out room **22**. However, the drive cables **1502** may be differently secured to the slide-out room **22** via other anchoring means.

In the illustrated embodiments, eight (8) of the drive cables **1402** are utilized, where four (4) of the drive cables **1402** may be utilized for pulling the slide-out room **22** out of the vehicle **10** (i.e., connected proximate to the rear frame **408** of the slide-out room **22**) and where the other four (4) drive cables **1402** may be utilized for pulling the slide-out room **22** into the vehicle **10** (i.e., connected proximate to the outside wall **38** of the slide-out room **22**). Accordingly, four (4) of the drive cables **1402** may be arranged on each of the opposing left and right sidewalls **34**,**36** of the slid-out room **22**, with each of the drive cables **1402** being secured at one of its first end to a corner of the slide-out room **22**. Each of the drive cables **1402** then extends into its associated jamb or frame member **1420**, wraps around a guide member(s) or pulley(s) arranged within the frame member **1420**, and connects (at its second end) to the drive chain **1502** via the connector **1520**. Thus, for example, when the drive chain **1502** rotates in the first direction D**1**, it pulls the four (4) drive cables **1402** attached at the upper and lower corners of the sidewalls that are proximate to the front wall **14** of the slide-out room **22**, and simultaneously gives slack in the other four (4) drive cables **1402** attached at the upper and lower corners of the sidewalls that are proximate to the rear wall of the slide-out room **22**. For example, rotation of the drive chain **1502** in the first direction D**1** pulls a front upper and front lower drive cable **1542***a,b* in a direction X**1**, while simultaneously providing slack to a rear upper and rear lower drive cable **1542***c,d* to facilitate retraction of the slide-out room **22**; whereas, rotation of the drive chain **1502** in the second direction D**2** pulls a rear upper and rear lower drive cable **1542***c,d* in a direction X**2**, while simultaneously providing slack to the front upper and front lower drive cable **1542***a,b* to facilitate extension of the slide-out room **22** from the vehicle **10**.

In the illustrated embodiment, the drive chain **1502** is connected to a pair of the connectors **1520**, and each of the connectors **1520** is secured to two (2) of the drive cables **1402**. Also, the cables **1402** extend from opposite sides of the connector **1520** such that, as the drive chain **1502** rotates in the first direction D**1**, some of the cables **1402** (i.e., the

rear upper and rear lower drive cables **1542***c,d*) will give slack in direction X**1** and the other drive cables **1402** (i.e., the front upper and front lower drive cables **1542***a,b*) will be pulled in that direction X**1**.

In the illustrated example of FIGS. **15**A-**15**D, the first connector **1520***a* is coupled to the rear upper drive cable **1542***c* and the front lower drive cable **1542***b*, where the rear upper drive cable **1542***c* is secured to an upper rear side of the slide-out room **22** and the front lower drive cable **1542***b* is secured to a lower front side of the slide-out room **22**. Similarly, the second connector **1520***b* is coupled to the front upper drive cable **1542***a* and the rear lower drive cable **1542***d*, where the front upper cable **1542***a* is secured to an upper front side of the slide-out room **22** and the rear lower drive cable **1542***d* is secured to a lower rear side of the slide-out room **22**. The front upper drive cable **1542***a* extends upward from the second connector **1520***b* towards the upper end of the frame member **1420**, up and around a first cable track of the top cable guide **1510**, and out a front upper opening in the frame member **1420** towards the front of the slide-out room **22**. The rear lower drive cable **1542***d* extends downward from the second connector **1520***b*, along a first cable track of the cable idler **1514** (thereby redirecting the rear lower drive cable **1542***d*), down and around a first cable track of the bottom cable guide **1512**, and out a rear lower opening in the frame member **1420** towards the rear of the slide-out room **22**. The front lower drive cable **1542***b* extends downward from the first connector **1520***a*, along a second cable track of the cable idler **1514** (thereby redirecting the front lower drive cable **1542***b*), down and around a second cable track of the bottom cable guide **1512**, and out a front lower opening in the frame member **1420** towards the front of the slide-out room **22**. Finally, the rear upper drive cable **1542***c* extends upward from the first adjuster **1520***a* toward the upper end of the frame member **1420**, up and around a second cable track of the top cable guide **1510**, and out a rear upper opening in the frame member **1420** towards the rear of the slide-out room **22**.

Accordingly, when the drive chain **1502** rotates in the first direction D**1**, the drive chain **1502** pulls the front upper drive cable **1542***a* and the front lower drive cable **1542***b* and pushes or slackens (i.e, provides slack in) the rear upper drive cable **1542***c* and the rear lower drive cable **1542***d*. In this manner, the front side of the slide-out room **22** may be pulled towards the opening **18** in the vehicle **10** via the front upper and lower drive cables **1542***a*,**1542***b* such that the slide-out room **22** is retracted within the vehicle **10**. When the drive chain **1502** rotates in the second direction D**2**, the drive chain **1502** pulls the rear upper drive cable **1542***c* and the rear lower drive cable **1542***d*, while pushing or slackening (i.e., providing slack in) the front upper and lower drive cables **1542***a*,**154***bc*. In this manner, the rear side of the slide-out room **22** may be pulled towards the opening **18** in the vehicle **10** via the rear upper drive cable **1542***c* and the rear lower drive cable **1542***d* such that the slide-out room **22** is extended from within the vehicle **10**.

In these embodiments, the motor **1504** may be arranged in each of the jamb assemblies **1410***a*,**1410***b* to drive one of the sprockets (e.g., the drive sprocket **1506** or the idler sprocket **1508**) therein and engage the other sprocket therein (e.g., the idler sprocket **1508** or the drive sprocket **1506**) via the drive chain **1502** configured as an endless chain that is also arranged therein; and in such embodiments, the motors **1504** in the opposing jamb assembly **1410** may be synchronized or timed, for example, via a Hall effect sensor. In even other embodiments, the slide-out drive assembly includes a timing shaft or belt that synchronizes the rotation of the drive sprockets that are arranged in the opposing jambs. In some of these embodiments, a single motor may be provided within one of the jambs (i.e., the drive side jamb) to power the drive sprocket in the drive side jamb as well as the timing shaft or belt, and the timing shaft or belt in turn drives the drive sprocket arranged in the opposing jamb (i.e., the slave side jamb) such that the drive sprockets in the drive side jamb and the slave side jamb are synchronized, as will be appreciated by those skilled in the art. In even other embodiments, both the drive side jamb and the slave side jamb include a motor and their respective drive sprockets (and/or idler sprockets) are synchronized with a timing shaft or belt, as will be appreciated by those skilled in the art.

As mentioned, the assembly **1400** may include the screw drive **1602** that is configured to actuate the drive cables **1402**. FIGS. **16-18** illustrate an example of the jamb assembly **1410** configured with the screw drive **1602** according to one or more embodiments, whereas FIGS. **19-21** and FIGS. **23-24** illustrate alternate examples of screw drives utilizable with the jamb assembly **1410**, according to various alternate embodiments. In these examples, the screw drive **1602** may be arranged within the frame member or jamb member **1420**. Here, the motor **1608** is arranged within an upper end of the frame member **1420** and the drive shaft **1606** extends, vertically along an axis A of the drive shaft **1606**, from the upper end of the frame member **1420** towards a lower end of the frame member **1420**. The drive shaft **1606** is coupled to the motor **1608**, such that actuation of the motor **1608** rotates the drive shaft **1606** in a first or second rotational direction R**1**,R**2** about the axis A. The drive shaft **1606** may be configured as a threaded rod. Also, the drive nut **1604** includes a bore through which the drive shaft **1606** extends. The bore of the drive nut **1604** is configured to engage the drive shaft **1606**, such that rotation of the drive shaft in the first rotational direction R**1** causes the drive nut **1604** to translate along the axis A of the drive shaft **1606** in a first axial direction Y**1**, and rotation of the drive shaft **1606** in the second rotational direction R**2** (that is opposite the first rotational direction R**1**) causes the drive nut **1604** to translate along the axis A of the drive shaft **1606** in a second axial direction Y**2** (that is opposite of the first axial direction Y**1**). The manner in which the screw drive **1602** translates rotation of the drive shaft **1606** into linear movement of the drive nut **1604** may vary. For example, the screw drive **1602** may be configured as an acme screw, a ball screw, etc.

In these examples, the jamb assemblies **1410** may also be configured with a plurality of guides or pulleys for routing the drive cables **1402** as hereinafter described. In the illustrated example of FIGS. **16-18**, a top and bottom cable guide **1610**,**1612** are provided and secured at top and bottom ends of the frame member **1420**, respectively. The top and bottom cable guides **1610**,**1612** may be configured as double pulleys such that they each may receive a pair of the drive cables **1402** without interfering with each other or causing rubbing or friction between the drive cables **1402**. This means, for example, that the top cable guide **1610** includes a pair of independent pulleys that may rotate relative to each other, or include independent cable tracks, so as to permit a pair of the drive cables **1402** to travel therein in opposing direction without interference; and the bottom cable guide **1612** may be similarly configured. Here, the top and bottom cable guides **1610**,**1612** are configured as double pulleys; however, in other examples, a pair of top cable guides and a pair of bottom cable guides may be utilized instead, as described below. Also in the illustrated example, an upper cable idler **1614** is arranged proximate to the top cable guide **1610** and a lower cable idler **1616** is arranged proximate to the bottom

cable guide **1612**. As hereinafter described, the upper and lower cable idlers **1614**,**1616** are configured to redirect the path of any of the drive cables **1402**; and, where utilized, the cable idler may also be configured as a double pulley, such that it may redirect and guide a pair of the drive cables **1402**, without interference, rubbing, or friction between the drive cables **1402**. In the illustrated example, the upper and lower cable idlers **1614**,**1616** are attached to the web portion of the frame member **1420**; however, they may be differently arranged within the frame member **1420**, for example, on the same sidewall thereof, on opposing sidewalls, on the web portion and a sidewall, etc.

The internal components of the jamb assembly **1410** configured with the screw drive **1602** may be coupled or fastened within the frame member **1420** via a variety of manners. In some examples, the motor **1608** is mounted within the frame member **1420** via a collar **1620**, and, in some of these examples, the collar **1620** may include one or more dampeners and/or be otherwise configured to inhibit or counteract vibrations from the motor **1608**. The motor **1608** may be differently arranged within the frame member **1420**. Also, a far end of the shaft **1606** (i.e., the end of the shaft **1606** that is opposite from an opposing end of the shaft **1606** at which the motor **1608** is mounted) may mounted to the frame member **1420** via a variety of manners. In the illustrated example, the far end of the shaft **1606** is coupled within the frame member **1420** via a bracket **1622**. Here, a bearing or bearing assembly **1624** is arranged within the bracket **1622** such that the shaft **1606** may rotate when secured within the bracket **1622**.

FIG. **18**A illustrates the path of the drive cables **1402** utilized in the example of FIGS. **16-17**, and FIG. **18**B illustrates an example of the drive nut **1604** configured to actuate the drive cables along the path of FIG. **18**A. The drive cables **1402** include a front upper drive cable **1642***a* (which is secured to a front upper side of the slide-out room **22**), a front lower drive cable **1642***b* (which is secured to a front upper side of the slide-out room **22**), a rear upper drive cable **1642***c* (which is secured to a rear upper side of the slide-out room **22**), and a rear lower drive cable **1642***d* (which is secured to a rear lower side of the slide-out room **22**). In the illustrated example, the front upper drive cable **1642***a* and the front lower drive cable **1642***b* extend from an upper side of the drive nut **1604**, and the rear upper drive cable **1642***c* and the rear lower drive cable **1642***d* extend from a lower side of the drive nut **1604**. In this manner, the front upper drive cable **1642***a* and the front lower drive cable **1642***b* are actuated together and the rear upper drive cable **1642***c* and the rear lower drive cable **1642***d* are actuated together opposite from the front upper drive cable **1642***a* and the front lower drive cable **1642***b*. More particularly, movement of the drive nut **1602** in the first axial direction Y**1** pushes the front upper drive cable **1642***a* and the front lower drive cable **1642***b* out of the frame member **1420** (i.e., provides slack), while pulling the rear upper drive cable **1642***c* and the rear lower drive cable **1642***d* into the frame member **1420**; whereas movement of the drive nut **1602** in the second axial direction Y**2** pulls the front upper drive cable **1642***a* and the front lower drive cable **1642***b* into the frame member **1420**, while pushing (i.e., slackening) the rear upper drive cable **1642***c* and the rear lower drive cable **1642***d* out from the frame member **1420**.

Also in the illustrated example, the front upper drive cable **1642***a*, the front lower drive cable **1642***b*, the rear upper drive cable **1642***c*, and the rear lower drive cable **1642***d* are each an adjustably secured drive nut **1604**. Thus, they may be unattached from the drive nut **1604**, pulled tight, and reattached to the drive nut **1604** as needed to adjust their lengths. Also, the drive nut **1604** may be configured to guide any of the drive cables **1402** such that the cables **1402** are organized within the frame member **1410***a*nd do not become tangled. Here, for example, the drive nut **1604** includes a pair of guide slots formed therein. In particular, the first such guide slot is formed within the drive not **1604** for receiving the front lower drive cable **1642***b* (after being re-routed over the upper idler **1614**) and organizes the front lower drive cable **1642***b* between the front upper drive cable **1642***a* and the rear upper drive cable **1642***c*; and, the second such guide slot is formed within the drive not **1604** for receiving the rear upper drive cable **1642***c* (after being re-routed over the lower idler **1616**) and organizes the rear upper drive cable **1642***c* between the front lower drive cable **1642***b* and the rear lower drive cable **1642***d*. However, the drive nut **1604** may be differently configured to organize any or all of the drive cables **1402**.

As illustrated, the front upper drive cable **1642***a* extends upward from the upper side of the drive nut **1604**, towards the upper end of the frame member **1420**, up and around a first cable track of the top cable guide **1610**, and out a front upper opening in the frame member **1420** towards the front upper corner of the slide-out room **22**. The front lower drive cable **1642***b* extends upward from the upper side of the drive nut **1604**, around and along a cable track of the upper cable idler **1614** (thereby redirecting the front lower drive cable **1642***b* downward within the frame member **1420** and through the guide slot formed in the drive nut **1604**), down and around a first cable track of the bottom cable guide **1612**, and out a front lower opening in the frame member **1420** towards the front lower corner of the slide-out room **22**. The rear upper drive cable **1642***c* extends downward from the bottom side of the drive nut **1604**, around and along a cable track of the lower cable idler **1616** (thereby redirecting the rear upper drive cable **1642***c* upward within the frame member **1420** and through the guide slot formed in the drive nut **1604**), up and around a second cable track of the top cable guide **1610**, and out a rear upper opening in the frame member **1420** towards the rear upper corner of the slide-out room **22**. Finally, the rear lower drive cable **1642***d* extends downward from the bottom side of the drive nut **1604**, toward the lower end of the frame member **1420**, down and around a second cable track of the bottom cable guide **1612**, and out a rear lower opening in the frame member **1420** towards the lower rear corner of the slide-out room **22**.

Accordingly, upon rotation of the drive shaft **1606** in the first rotational direction R**1**, thereby translating the drive nut **1604** linearly along the axis A in the first axial direction Y**1**, the drive nut **1604** pulls the rear upper drive cable **1642***c* and the rear lower drive cable **1642***d* and pushes or slackens the front upper drive cable **1542***a* and the front lower drive cable **1542***c*. In this manner, the rear side of the slide-out room **22** may be pulled towards the opening **18** in the vehicle **10** via the rear upper and lower drive cables **1642***c*,**1642***d* such that the slide-out room **22** is extended from the vehicle **10**. When the drive shaft **1606** rotates in the second rotational direction R**2**, the drive nut **1604** pulls the front upper drive cable **1542***a* and the front lower drive cable **1542***b*, while pushing or slackening (i.e., providing slack in) the rear upper and lower drive cables **1542***c*,**1542***d*. In this manner, the front side of the slide-out room **22** may be pulled towards the opening **18** in the vehicle **10** via the front upper drive cable **1542***a* and the front lower drive cable **1542***b*, such that the slide-out room **22** is retracted within the vehicle **10**.

FIGS. **19-21** illustrate example of the jamb assembly **1410** configured with the screw drive **1602** having a different

configuration of guide members and pulleys such that the drive cables **1402** are differently routed. Here, the jamb assembly **1410** includes a pair of top cable guides **1910***a*, **1910***b* and a pair of bottom cable guides **1912***a*,**1912***b*. In the illustrated example, the top and bottom cable guides **1910***a*, **1910***b*,**1912***a*,**1912***b* are each configured as single pulleys, and each include a single cable track for accommodating one of the drive cables **1402**; however, in other examples, any or all of the top and bottom cable guides **1910***a*,**1910***b*,**1912***a*, **1912***b* may be configured with more than one cable track for accommodating more than one of the drive cables **1402** and, in such examples, may further be configured as a double pulley that permits independent actuation of the drive cables **1402**. Also in the illustrated example, an upper cable idler **1914** is arranged proximate to the top cable guides **1910***a*, **1910***b* and a lower cable idler **1916** is arranged proximate to the bottom cable guides **1912***a*,**1912***b*. As hereinafter described, the upper and lower cable idlers **1914**,**1916** are configured to redirect the path of any of the drive cables **1402**; and, where utilized, the cable idlers **1914**,**1916** may also be configured as a double pulley, such that it may redirect and guide a pair of the drive cables **1402**, without interference, rubbing, or friction between the drive cables **1402**. In the illustrated example, the upper and lower cable idlers **1914**,**1916** are attached to opposing sidewalls of the frame member **1420** (i.e., the upper cable idler **1914** is attached to a first sidewall and the lower cable idler **1916** is attached to a second sidewall opposite to the first sidewall); however, they may be differently arranged within the frame member **1420**, for example, on the same sidewall thereof, on the web portion thereof, on the web portion and a sidewall, etc.

FIG. **21**A illustrates the path of the drive cables **1402** utilized in the example of FIGS. **19-20**, and FIG. **21**B illustrates an example of the drive nut **1604** configured to actuate the drive cables along the path of FIG. **21**A. The drive cables **1402** include a front upper drive cable **1942***a* (which is secured to a front upper side of the slide-out room **22**), a front lower drive cable **1942***b* (which is secured to a front upper side of the slide-out room **22**), a rear upper drive cable **1942***c* (which is secured to a rear upper side of the slide-out room **22**), and a rear lower drive cable **1942***d* (which is secured to a rear lower side of the slide-out room **22**). In the illustrated example, the front upper drive cable **1942***a* and the front lower drive cable **1942***b* extend from the lower side of the drive nut **1604**, and the rear upper drive cable **1942***c* and the rear lower drive cable **1942***d* extend from the upper side of the drive nut **1604**. In this manner, the front upper drive cable **1942***a* and the front lower drive cable **1942***b* are actuated together and the rear upper drive cable **1942***c* and the rear lower drive cable **1942***d* are actuated together. More particularly, movement of the drive nut **1602** in the second axial direction Y**2** pushes the front upper drive cable **1942***a* and the front lower drive cable **1942***b* out of the frame member **1420** (i.e., provides slack), while pulling the rear upper drive cable **1942***c* and the rear lower drive cable **1942***d* into the frame member **1420**; whereas movement of the drive nut **1602** in the first axial direction Y**1** pulls the front upper drive cable **1942***a* and the front lower drive cable **1942***b* into the frame member **1420**, while pushing (i.e., slackening) the rear upper drive cable **1942***c* and the rear lower drive cable **1942***d* out from the frame member **1420**.

As with the drive nut **1604** in the examples illustrated with respect to FIGS. **16-18**, the front upper drive cable **1942***a*, the front lower drive cable **1942***b*, the rear upper drive cable **1942***c*, and the rear lower drive cable **1942***d* may each be an adjustably secured drive nut **1604**. Thus, they may be unattached from the drive nut **1604**, pulled tight, and reattached to the drive nut **1604** as needed to adjust their lengths. Also, the drive nut **1604** may be configured organize any or all of the drive cables **1942***a*,**1942***b*,**1942***c*,**1942***d* within the frame member **1410** so that they do not become tangled. Here, for example, the drive nut **1604** includes a pair of guide slots formed therein, where a first such guide slot receives the front upper drive cable **1942***a* (after being re-routed over the lower idler **1916**) and organizes it at a first corner of the drive nut **1604**, and a second such guide slot receives the rear lower drive cable **1942***d* (after being re-routed over the upper idler **1914**) and organizes it at a second corner of the drive nut **1604**. However, the drive nut **1604** may be differently configured to organize any or all of the drive cables **1402**.

As illustrated, the front upper drive cable **1942***a* extends downward from the lower side of the drive nut **1604**, towards the lower end of the frame member **1420**, around and along a cable track of the lower cable idler **1916** (thereby redirecting the front upper drive cable **1942***a* upward within the frame member **1420** and through the guide slot formed in the drive nut **1604**), up and around the (first) top cable guide **1910***a*, and out a front upper opening in the frame member **1420** towards the front upper corner of the slide-out room **22**. The front lower drive cable **1942***b* extends downward from the lower side of the drive nut **1604**, down and around the (first) bottom cable guide **1912***a*, and out a front lower opening in the frame member **1420** towards the front lower corner of the slide-out room **22**. The rear upper drive cable **1942***c* extends upward from the upper side of the drive nut **1604**, up and around the (second) top cable guide **1910***b*, and out a rear upper opening in the frame member **1420** towards the rear upper corner of the slide-out room **22**. Finally, the rear lower drive cable **1942***d* extends upward from the upper side of the drive nut **1604**, around the upper cable idler **1914** (thereby redirecting the rear lower drive cable **1942***d* downward within the frame member **1420** and through the guide slot formed in the drive nut **1604**), toward the lower end of the frame member **1420**, down and around a track of the (second) bottom cable guide **1912***b*, and out a rear lower opening in the frame member **1420** towards the lower rear corner of the slide-out room **22**.

Accordingly, upon rotation of the drive shaft **1606** in the second rotational direction R**2**, thereby translating the drive nut **1604** linearly along the axis A in the second axial direction Y**2**, the drive nut **1604** pulls the rear upper drive cable **1942***c* and the rear lower drive cable **1942***d* and pushes or slackens the front upper drive cable **1942***a* and the front lower drive cable **1942***b*. In this manner, the rear side of the slide-out room **22** may be pulled towards the opening **18** in the vehicle **10** via the rear upper and lower drive cables **1942***c*,**1942***d* such that the slide-out room **22** is extended from the vehicle **10**. When the drive shaft **1606** rotates in the first rotational direction R**1**, thereby translating the drive nut **1604** in the first axial direction Y**1**, the drive nut **1604** pulls the front upper drive cable **1942***a* and the front lower drive cable **1942***b*, while pushing or slackening (i.e., providing slack in) the rear upper and lower drive cables **1942***c*,**1942***d*. In this manner, the front side of the slide-out room **22** may be pulled towards the opening **18** in the vehicle **10** via the front upper drive cable **1942***a* and the front lower drive cable **1942***b*, such that the slide-out room **22** is retracted within the vehicle **10**.

FIG. **22** illustrates an exemplary tracking roller assembly **2200**, according to one or more examples. For example, the tracking roller assembly **2200** may be utilized with any of the cable driven slide-out assemblies described herein,

including but not limited to those illustrated with respect to FIGS. **14-21** of FIGS. **23-29**. The tracking roller assembly **2200** may be utilized to evenly guide the slide-out room **20** and maintain it in a centered position within the opening **18** of the vehicle **10**. In the illustrated example, tracking roller assembly **2200** includes a roller **2202** and a mounting bracket **2204** having a pair of flanges **2206**,**2208** for holding the roller **2202**. The roller **2202** is arranged between the flanges **2206**,**2208** such that the roller **2202** may rotate relative to the mounting bracket **2204**. Thus, the roller **2202** is rotatably mounted to or rotatably arranged within the mounting bracket **2204**. The tracking roller assembly **2200** may be attached to an outer surface of the frame member **1420** that is proximate to the slide-out unit **22**. Here, for example, the mounting bracket **2204** is secured to an outer surface of the web of the frame member **1420**. Also, the tracking roller assembly **2200** may be provided at an upper end of each jamb assembly **1410**, a lower end of each jamb assembly **1410**, a middle of each jamb assembly **1410**, or any combination thereof. Here, for example, each of the left and right jamb assemblies **1410***a*,**1410***b* includes a tracking roller assembly **2200** at the upper and lower ends of the frame member **1420**. In some examples, bearings are provided within the roller **2202** to engage a shaft (not illustrated) connected between the flanges **2206**,**2208**; whereas, in other examples, the roller **2202** includes an integral shaft that is rotatably attached within apertures in the flanges **2206**,**2208** and a bearing may be provided within the apertures of the flanges **2206**,**2208**.

FIG. **23** illustrates an alternate screw drive assembly **2300** configured to actuate the drive cables to move the slide-out room **22** relative to the vehicle **10**. The screw drive assembly **2300** may be provided in a jamb assembly and secured to the vehicle **10** as previously described. For example, the screw drive assembly **2300** may be provided in the left and right jamb assembly **1410***a*,**1410***b* which are secured within the opening **18** in the vehicle **10**.

In the illustrated example, the screw drive assembly **2300** includes a drive nut **2302** that translates axially along a drive rod **2304** upon rotation of the drive rod **2304**. Here, a plurality of drive cables **2306** are connected to the drive nut **2302** such that they move with the drive nut **2302** as it translates along the drive rod **2304**. The drive cables **2306** are routed, from the drive nut **2302**, about one or more pulleys. In particular, the screw drive assembly **2300** includes a pair of double pulleys **2308**, **2310** and a pair of guide members **2312**,**2314**. The double pulleys **2308**,**2310** are configured to allow movement of a pair of the drive cables **2306**, independently from each other, whereas the guide members **2312**,**2314** are configured as single pulleys for re-routing the drive cables **2306** as described above. Here, a first of the drive cables **2306***a* extends downward from the drive nut **2302**, around the guide member **2314** where it is re-routed upward, and around a first track of the double pulley **2308**; a second of the drive cables **2306***b* extends downward from the drive nut **2302** and around a first track of the double pulley **2310**, such that it moves in the same direction as the first drive cable **2306***a*; a third of the drive cables **2306***c* extends upward from the drive nut **2302** and around a second track of the double pulley **2308**; and a fourth of the drive cables **2306***d* extends upward from the drive nut **2302**, around the guide member **2312** where it is re-routed downward, and around a second track of the double pulley **2310**, such that it moves in the same direction as the third drive cable **2306***c*.

The drive cables **2306** are adjustably connected to one or more aspects of the screw drive assembly **2300**. In some examples, the drive cables **2306** are adjustably connected to the drive nut **2302**, such that the tension of the drive cables **2306** may be adjusted at the drive nut **2302**. FIG. **24** illustrates an example of the drive nut **2302** configured to permit adjustment of the drive cables **2306**, according to one or more embodiments. In the illustrated examples, each of the drive cables **2306** (i.e., the first, second, third, and fourth drive cables **2306***a-d*) include a threaded rod **2402** at their ends proximate to the drive nut **2302**. The drive cables **2306** may also include threaded rod (not illustrated) at their other terminal end proximate to the slide-out room **22**. The threaded rod **2402** of the drive cables **2306** may be secured to the drive nut **2302** via a nut **2404**, whereby rotation of the nut **2404** causes the threaded rod **2402** to translate linearly through the drive nut **2302**. Thus, the nut **2404** may be rotated in a first direction to move the threaded rod **2402** in a first direction that tensions the corresponding drive cable **2306**, or rotated in a second direction to move the threaded rod **2402** in a second opposite direction that un-tensions the corresponding drive cable **2306**. Lock washers may be utilized to maintain tension in the drive cables **2306**. For example, lock washers may be provided on a side of the drive nut **2302** opposite of the nut **2304**. Alternatively, lock washers may be provided within the drive nut **2302**.

FIGS. **25-27** illustrate an exemplary drive assembly **2500** that articulates the slide-out room **22** via a block and tackle configuration, according to one or more embodiments. FIG. **25** illustrates the drive assembly **2500** from an interior of the vehicle **10**. The drive assembly **2500** includes at least one block and tackle assembly **2502**. In the illustrated example, the drive assembly **2500** is secured to the vehicle **10** at a location beneath the slide-out room **22** and includes a pair of block and tackle assemblies **2502***a*,**2502***b* corresponding with the left and right side of the slide-out unit **22**. In other examples, however, the drive assembly **2500** may be secured to the vehicle **10** at a location above the slide-out room **22**. In even other examples, the drive assembly **2500** may be differently arranged about the slide-out room **22**, for example proximate to the left or right side of the opening **18** in the vehicle **10**, and the block and tackle assemblies **2502***a*,**2502***b* may correspond with a top and bottom of the slide-out room **22**.

Here, the drive assembly **2500** includes a drive sprocket **2504** that articulates the block and tackle assemblies **2502***a*, **2502***b*. The drive sprocket **2504** may be driven by a variety of means. For example, the drive sprocket **2504** may be connected to a motor or other actuator or may be manually driven via a crank shaft. In the illustrated example, the drive sprocket **2504** is configured as a double sprocket that drives a pair of drive chains **2506***a*,**2506***b*, with the block and tackle assembly **2502***a* connected to the ends of the drive chain **2506***a* and the block and tackle assembly **2502***b* connected to the ends of the drive chain **2506***b*.

FIG. **26** illustrates the block and tackle assembly **2502** of FIG. **25**, according to one or more embodiments. While FIG. **26** illustrates only one block and tackle assembly **2502** (e.g., the block and tackle assembly **2502***a*), it will be appreciated that both of the block and tackle assemblies **2502***a*,**2502***b* may be similarly configured.

The block and tackle assembly **2502** includes a pair of moving blocks **2602***a*,**2602***b* that are each connected to the drive chain **2506**. The block and tackle assembly **2502** further includes a pair of fixed blocks **2604***a*,**2604***b* that are connected to the vehicle **10**. As illustrated, the moving blocks **2602***a*,**2602***b* and the fixed blocks **2604***a*,**2604***b* are

each configured as double pulleys (or double blocks), and thus each include a pair of pulleys that may rotate independent from each other.

The block and tackle assembly **2502** includes four (4) drive cables **2608**. Each of the drive cables **2608** is provided as a cable length having a pair of cable ends **2610**, with a first cable end (obscured from view) being affixed to the slide-out unit **22** and the second cable end **2610** being attached to the vehicle **10**. Here, the four (4) drive cables **2608** are routed, from their cable ends **2610**, around the moving blocks **2602***a*,**2602***b* and around the fixed blocks **2604***a*,**2604***b*, to the opposing cable ends secured to the slide-out room **22**. Thus, the drive cables **2608** are each arranged about the moving blocks **2602***a,b* and the fixed blocks **2604***a*, **2604***b* in a double tackle configuration, such that rotation of the moving blocks **2602***a,b* via the drive chain **2506** in a first rotational direction causes two (2) of the drive cables **2608** to be pulled towards the opening **18** in the vehicle and causes the other two (2) of the drive cables **2608** to be pushed away (i.e., slackens) from the opening **18** in the vehicle **10**.

The drive cables **2608** may be adjustably attached to the vehicle **10**. Here, for example, each of the drive cables **2608** is adjustably attached to a frame member **2612** that is secured to the vehicle **10**. In the illustrated example, each cable end **2610** of the drive cables **2608** includes a stud **2614** extending therefrom and a threaded rod **2616** extending from the stud **2614**. The threaded rod **2616** may be rotatably attached to the stud **2614** such that the stud **2614** and the threaded rod **2616** may rotate relative to each other, and thereby inhibit twisting of the drive cables **2606** when tensioning the same as hereinafter described. The threaded rod **2616** extends through an aperture **2618** in the frame member **2612** and is received by a nut **2620**, whereby rotation of the nut **2620** causes axial translation of the threaded rod **2616** through the aperture **2618**, thereby adding tension or removing tension from the drive cable **2608** corresponding therewith. In this example, rotation of the drive cable **2608** may be inhibited via the joint coupling stud **2614** and the threaded rod **2616** and permits relative rotation there between.

Different means may be utilized to adjustably connect the drive cables **2608** to the frame member **2612**, however. For example, the frame member **2612** may include four (4) cable adjustment mechanisms (not illustrated) that are rotatably attached within apertures **2618** in the frame member **2612**, such that each of the cable adjustment mechanisms may rotate within the apertures **2618** of the frame member **2612**. Also in this example, each of the cable adjustment mechanisms is configured as an elongated nut having a threaded bore for receiving a threaded rod or stud that is connected to the cable ends **2610** of the drive cable **2608**. The threaded rod includes a thread that corresponds with the thread of the cable adjustment mechanism. Thus, rotation of the cable adjustment mechanism will cause the threaded rod arranged therein to translate axially within the threaded bore of the cable adjustment mechanism, thereby adding tension or removing tension from the drive cable **2608** associated therewith. In some examples, the cable ends **2610** of the drive cable **2608** include a joint configured to permit relative rotation between the threaded rod and the drive cables **2608**, to thereby inhibit the drive cables **2608** from being twisted when tensioning them.

Other means may be utilized to adjust the drive assembly **2500**. FIG. **27** illustrates a close up of the moving blocks **2602***a*,**2602***b* configured to be adjusted relative to the drive chain **2506**. The drive chains **2506** may each be provided as a segment or strand of chain having two opposing ends **2700***a*,**2700***b* that are unconnected to each other (i.e., an open chain configuration). In such embodiments, the moving blocks **2602***a*,**2602***b* are connected to the opposing ends **2700***a*,**2700***b*, respectively, of the drive chain **2506**. The moving blocks **2602***a*,**2602***b* may be adjustably connected to the drive chain **2506**, which may facilitate adjusting the tension in drive assembly **2500** to ensure smooth and even movement of the slide-out room **22** driven thereby. Here, a stud **2702** is coupled to each of the opposing ends **2700***a*, **2700***b* via a link bracket **2704** that is pinned to one or more links of the drive chain **2506**. The studs **2702** are attached to the link brackets **2704** and, in some examples, are permitted to rotate relative to the link brackets **2704**. The studs **2702** include a threaded portion and extend through a corresponding aperture (obscured from view) in the frames of the moving blocks **2602***a*,**2602***b*. An adjustment nut **2706** is provided within the moving blocks **2602***a*,**2602***b*, and a second nut **2708** may be provided exterior of the moving blocks **2602***a*,**2602***b* on the opposite side of the aperture from the adjustment nut **2706**. The adjustment nut **2706** may be rotated to linearly translate the threaded portions of the studs **2702** within the aperture of the moving blocks **2602***a*, **2602***b*, and thereby adjust the tension of the moving blocks **2602***a*,**2602***b* and the drive cables **2608** arranged therein relative to the drive chain **2506**. In addition, one or more lock washers may be utilized to help lock the location of the stud **2702** relative to the moving blocks **2602***a*,**2602***b*.

Other means of adjusting the drive cables **2608** may be provided in addition to or in lieu of the foregoing. For example, the fixed blocks **2604***a*,**2604***b* may be adjustably secured to the vehicle **10** such that they may move to adjust the tension of the drive cables **2608** arranged therein. In one non-illustrated example, the fixed blocks **2604***a*,**2604***b* are secured on tracks within the vehicle **10** and may slide along the tracks as needed to adjust the tension in the drive cables **2608**. For example, tracks may be provided on an interior wall or frame of the vehicle **10** proximate to the opening **18**, and the fixed blocks **2604***a*,**2604***b* may be configured to translate along those tracks in a direction approximately perpendicular to the direction in which the drive chain **2506** rotates. Here, a ratchet mechanism may be utilized to translate either or both of the fixed blocks **2604***a*,**2604***b* along the tracks. The fixed blocks **2604***a*,**2604***b* may be adjusted together via a single ratchet mechanism, or they may be adjusted individually via separate ratchet mechanisms. Thus, the ratchet mechanism or other means may be utilized to move either or both of the fixed blocks **2604***a*, **2604***b* downward (away from the slide-out room **22**) to thereby add tension to the drive cables **2608** associated with the fixed blocks **2604***a*,**2604***b* that have been ratcheted to a new location.

The drive chain and/or the drive cables may be differently configured to articulate the slide-out room **22**. FIGS. **28-29** illustrate exemplary slide-out drive assemblies **2800**,**2900**, wherein movement of the slide-out room **22**, via a first of a plurality of drive cable (or a first cable end of a first of a pair of drive cables), engages one or more of the remaining drive cables (or one or more of the remaining cable ends of the pair of drive cables) to simultaneously pull the slide-out room **22** in the same direction, according to one or more alternate embodiments. In this manner, the slide-out drive assemblies **2800**,**2900** (hereinafter, the drive assemblies **2800**,**2900**) tension a single drive cable (or a single cable end of a first drive cable) to move the slide-out room **22** in a first direction, which in turn synchronizes activation or tensioning of one or more remaining drive cables (or cable ends of a second drive cable). As more fully described

below, the drive assembly **2800** of FIG. **28** includes a discontinuous segment or strand of drive chain; whereas, the drive assembly **2900** of FIG. **29** utilizes a continuous loop of drive chain, which may permit utilization of a timing shaft. Regardless of the configuration of the drive chain, however, the drive chain of both drive assemblies **2800**,**2900** tensions a single cable (or single cable end) to move the slide-out room **22**, and at least one of the remaining cables (or cable ends) are tensioned via such movement of the slide-out room **22** such that the slide-out drive assemblies **2800**,**2900** synchronize movement of the remaining cables or cable ends through the slide-out room **22**.

The slide-out drive assemblies **2800**,**2900** may be jamb mounted and, therefore, are shown incorporated into the left and right jamb assemblies **1410***a,b* of FIG. **14**. However, the drive assemblies **2800**,**2900** may instead be incorporated into either the left jamb assembly **1410***a* or the right jamb assembly **1410***b*, or the drive assemblies **2800**,**2900** may be incorporated into a top and/or bottom jamb assembly in addition to or in lieu of either or both of the left and right jamb assemblies **1410***a*,**1410***b*.

As more fully described below, the drive assemblies **2800**,**2900** may actuate a plurality of drive cables, which are routed through either or both of the left and right jamb assemblies **1410***a*,**1410***b*. In the illustrated example, each of the left and right jamb assemblies **1410***a*,**1410***b* includes four drive cables routed there-through, from the drive chain, to opposing sides of the slide-out room **22**; however, as previously mentioned, the four drive cables may be provided in just one of the left or right jamb assemblies **1410***a*,**1410***b*. Thus, in these examples, the drive chain tensions a first of four drive cables to pull the slide-out room **22** in a first direction, which causes the slide-out room **22** to activate or tension two of the remaining three drive cables to pull the slide-out room **22** in the first direction, simultaneously with the first drive cable. In other examples, the left and right jamb assemblies **1410***a*,**1410***b* each includes a pair (i.e., two) of drive cables routed there-through and interconnecting opposing sides of the slide-out room **22**, where at least one of the two drive cables is secured relative to the drive chain; however, as previously mentioned, the two drive cables may be provided in just one of the left or right jamb assemblies **1410***a*,**1410***b*. In this latter example, each of the pair of drive cables is connected to the drive chain at a connector, and the opposing ends or portions of each drive cable extending from the connector may each be conceptualized as an individual drive cable, such that the pair of drive cables effectively functions as if it had four drive cables. Thus, in these examples, the drive chain tensions a first cable end of the first drive cable to pull the slide-out room **22** in a first direction, which causes the slide-out room **22** to activate or tension the second drive cable's opposing cable ends to pull the slide-out room **22** in the first direction simultaneously with the first drive cable's first cable end.

With reference to FIG. **28**A, the drive assembly **2800** is incorporated into the left and right jamb assemblies **1410***a*, **1410***b*. However, the drive assembly **2800** may be incorporated into other jamb assemblies or combination of jamb assemblies provided about the opening **18** of the vehicle **10**. FIG. **28**B illustrates an individual jamb assembly (e.g., the left or right jamb assembly **1410***a*,**1410***b*) incorporating the drive assembly **2800**; however, it will be appreciated that one or more other jamb assemblies arranged around the slide-out room **22** may be similarly configured. As illustrated, the drive assembly **2800** includes a motor **2802** and a drive chain **2804**. A drive sprocket (obscured from view) is operatively coupled to the motor **2802**, and the drive chain **2804** extends around and engages the teeth of the drive sprocket, such that the motor **2802** may impart rotation on the drive sprocket (e.g., clockwise or counter-clockwise) to correspondingly drive or rotate the drive chain **2804**. For example, clockwise rotation of the drive sprocket rotates the drive chain **2804** as indicated by directional arrows R**1**, whereas counter-clockwise rotation of the drive sprocket would reverse movement of the drive chain **2804** in an opposite direction.

The motor **2802** may be positioned at various locations relative to the slide-out room **22**. In the illustrated example, the motor **2802** is mounted within an upper end of the frame members **1420** of the jamb assemblies **1410***a*,**1410***b* and thus oriented proximate to the ceiling **32** of the slide-out room **22**. However, the motor **2802** may be located elsewhere relative to the slide-out room **22**, for example, located about the floor of the slide-out room **22** (see, for example, FIG. **29**A) or located at various locations there-between.

As with other embodiments described herein, the drive assembly **2800** may be configured to synchronize or time the operation of the jamb assemblies **1410***a*,**1410***b*. For example, the drive assembly **2800** may be configured to electronically time or synchronize operation of the motors **2802** mounted in the frame members **1420** of the opposing jamb assemblies **1410***a*,**1410***b* and drive chains **2804** drive thereby. In the illustrated example, the drive assembly **2800** utilizes sensors and/or feedback to electronically time or synchronize operation of the motor **2802** incorporated in the left jamb assembly **1410***a* with the motor **2802** incorporated in the right jamb assembly **1410***b*. However, other means (electronic or mechanical) may be utilized to time or synchronize operation of the jamb assemblies **1410***a*,**1410***b*, in addition to or in lieu of the foregoing. For example, timing or synchronization may be achieved via a timing shaft (or belt) arranged under the floor of the slide-out room **22** and/or connecting or linking (i.e., hard-wiring or wireless) the motors **2802** of the jamb assemblies **1410***a*,**1410***b* to allow communication there-between.

In some embodiments, electronic timing of the motors **2802** is accomplished via Back Electromotive Force voltage ("BEMF" or "back EMF"). During operation, each of the motors **2802** may generate a back EMF, which is an electromotive force or voltage that opposes the change in current which induced it. Back EMF may be monitored and utilized to adjust voltage input to control the speed of either or both of the motors **2802**. For example, a supply voltage is applied to a first motor **2802** and a second motor **2802**, and this supply voltage causes the first and second motors **2802** to operate at respective output speeds. Operation of the first motor **2802** at its output speed generates a back EMF in the first motor **2802** that is proportional to its output speed and, similarly, operation of the second motor **2802** at its output speed generates a proportional back EMF in the second motor **2802**. However, variations in one or both of the motors **2802** (e.g., differences in supplied voltages, differences in efficiencies, etc.) may result in unsynchronized operation of the motors **2802**, which may in turn result in uneven extension or retraction of the slide-out room **22** (i.e., the drive assembly **2800** incorporated into the left jamb assembly **1410***a* may operate faster or slower than the drive assembly **2800** incorporated into the right jamb assembly **1410***b*). Accordingly, the drive assembly **2800** in opposing jamb members **1410***a*,**1410***b* may be electronically synchronized or timed using back EMF.

The drive assembly **2800** in opposing jamb members **1410***a*, **1410***b* may be electronically timed by reading back EMF in the first and second motors **2802** and controlling

their operation based on the measured or sensed back EMF. For example, a system **2801** may measure or read the back EMF in both the first motor **2802** and/or the second motor **2802**, and compare these back EMF readings to identify a discrepancy between the back EMF in the first motor **2802** and the back EMF in the second motor **2802**. Upon sensing a difference in back EMF between the first and second motor **2802**, voltage supplied to the first motor **2802** and/or the second motor **2802** may be controlled to adjust the output speed of the first and/or second motor **2802**. Thus, the system may time or synchronize operation of the first and second motors **2802** by comparing their back EMFs and then adjusting the voltage supplied to the faster and/or slower motor **2802** to equalize their output speeds. Such systems may include various types of sensors configured to measure back EMF. However, the system may instead (or in addition to sensors) utilize sensorless techniques to detect back EMF in the motors **2802**, and such sensorless techniques may include various types of comparator circuits, controllers, and/or microcontrollers. Accordingly, the system may incorporate various components, systems, and methods for controlling motor velocity utilizing feedback indicative of back EMF, including those disclosed in U.S. Pat. No. 5,811,946 which is incorporated by reference in its entirety.

In some examples, a controller **2880** may determine that the back EMF in the first motor **2802** is greater than the back EMF sensed in the second motor **2802** because the first motor **2802** is operating faster than the second motor **2802**. Here, the electronics (e.g., a controller **2880**) of the drive assembly **2800** may then limit or reduce the voltage supplied to the first motor **2802** a sufficient amount to thereby decrease the speed of the first motor **2802** such that the first motor **2802** operates at the same speed as the second motor **2802** (i.e., slowing down the first motor **2802** to match the speed of the second motor **2802**). This results in the first and second motors **2802** rotating their drive sprockets and drive chains **2804** at equal rates or speeds such that the slide-out room **22** is evenly extended or retracted at its opposing sides. In other examples, upon sensing that the back EMF in the first motor **2802** is greater than the back EMF sensed in the second motor **2802** (i.e., the first motor **2802** is operating faster than the second motor **2802**), the controller **2880** may increase the voltage supplied to the second motor **2802** to thereby increase the speed of the second motor **2802** (i.e., speeding up the second motor **2802**) to match or equal the output speed of the first motor **2802**. This will also result in the first and second motors **2802** rotating their drive sprockets and drive chains **2804** at equal rates that permit even extension or retraction of the slide-out room **22** at its opposing sides. In even other examples, the voltage in both the first motor **2802** and the second motor **2802** may be adjusted to equalize their output speeds upon detection of a difference between the back EMF in the first motor **2802** and the back EMF in the second motor **2802** (i.e., slowing down the first motor **2802** and speeding up the second motor **2802** to equalize output speeds of the first and second motors **2802**).

The drive chain **2804** may be provided as a non-continuous (or open) segment or strand of chain, which maintains engagement with the drive sprocket as it rotates in either direction. Here, for example, the drive chain **2804** is a U-shaped strand having opposing free ends **2806***a*,**2806***b*. However, the drive chain **2804** may have different non-continuous configurations or, as more fully described below, the drive chain **2804** may be provided as a continuous (or closed) segment or loop of chain.

Each of the opposing free ends **2806***a*,**2806***b* of the drive chain **2804** may be connected, adjustably or otherwise, to one or more drive cables. In the illustrated example, each of the opposing free ends **2806***a*,**2806***b* of the drive chain **2804** is coupled to a pair of drive cables, with the first opposing free end **2806***a* of the drive chain **2804** connected to a first drive cable **2810***a* and a second drive cable **2810***b* and the second opposing free end **2806***b* of the drive chain **2804** connected to a first drive cable **2812***a* and a second drive cable **2812***b*. Thus, in this example, there are four drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b*. As discussed below, each of the drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b* is routed through the jamb assembly **1410** towards opposite sides of the slide-out room **22**, with a cable end **2814***a* of the first drive cable **2810***a* connected to an exterior (or outer) side of the slide-out room **22**, a cable end **2814***b* of the second drive cable **2810***b* connected to an interior (or inner) side of the slide-out room **22** (opposite the exterior side thereof), a cable end **2816***a* of the second drive cable **2812***a* connected to the interior side of the slide-out room **22**, and a cable end **2816***b* of the second drive cable **2812***b* connected to the exterior side of the slide-out room **22**. The cable ends **2814***a*,**2814***b*,**2816***a*,**2816***b* may be connected at various locations about the slide-out unit **22** and, in some examples, are secured at the corners of a sidewall **34** (and/or opposing sidewall **36**) of the slide-out unit **22**. Here, the cable end **2814***a* of the first drive cable **2810***a* is routed through the jamb assembly **1410***a*nd connected to a bracket secured at an outer lower corner A of the slide-out room **22**; the cable end **2814***b* of the second drive cable **2810***b* is routed through the jamb assembly **1410***a*nd connected to a bracket secured at an inner upper corner D of the slide-out room **22**; the cable end **2816***a* of the first drive cable **2812***a* is routed through the jamb assembly **1410***a*nd connected to a bracket secured at an inner lower corner B of the slide-out room **22**; and the cable end **2816***b* of the second drive cable **2812***b* is routed through the jamb assembly **1410***a*nd connected to a bracket secured at an outer upper corner C of the slide-out room **22**. As mentioned, in other examples, each of the opposing free ends **2806***a*,**2806***b* of the drive chain **2804** is coupled to one drive cable, with the first opposing free end **2806***a* of the drive chain **2804** connected to a first drive cable and the second opposing free end **2806***b* of the drive chain **2804** connected to a second drive cable. Here, the first drive cable (connected to free end **2806***a* of the drive chain **2804**) includes opposing first and second ends routed through the jamb assembly **1410***a*nd connected to the slide-out room **22** at the outer lower corner A and the inner upper corner D, respectively, and the second drive cable (connected to the opposing free end **2806***b*) includes opposing first and second ends routed through the jamb assembly **1410***a*nd connected to the slide-out room **22** at the inner lower corner B and the outer upper corner C. The drive assembly **2800**, however, operates in a similar manner regardless of how many discrete drive cables are utilized.

FIG. **28**C illustrates the opposing free ends **2806***a*,**2806***b* of the drive chain **2804**, according to one or more embodiments of the present disclosure. The four drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b* each include a chain end at which they are coupled to the drive chain **2804**. Here, a pair of cable connectors **2807** is attached at each opposing free end **2806***a*,**2806***b*, such that each individual cable connector **2807** couples one of the four drive cables **2810***a*,**2810***b*, **2812***a*,**2812***b* to the drive cable **2804**. Also, the chain end of each of the four drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b* includes a bead or retention member **2809** configured to engage the cable connector **2807** associated therewith. In

some examples, the beads **2807** permit some movement of the drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b* while inhibiting other movements. For example, the beads **2809** may permit rotation of the drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b* relative to the cable connector **2807**, and may permit axial movement of drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b* in one direction while inhibiting axial movement in the opposite direction. Here, the beads **2809** are sized larger than an aperture in the cable connector **2807** through which the chain end of the respective drive cable extends, such that the cable connector **2807** will engage the bead **2809** when the drive chain **2804** is rotated, thereby pulling the drive cable associated therewith. In this example, the bead **2807** is not rigidly secured to the cable connector **2807** such that, when the chain **2804** is rotated in a direction causing the free ends **2806***a*,**2806***b* thereof to move towards the chain end of the drive cables, the cable connector **2807** may travel independent of its associated drive cable, with the aperture of the cable connector **2807** moving relative to the associated chain end. Thus, the beads **2809** may permit the cable connector **2807** to pull one of the drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b* without the cable connector **2807** engaging or activating one or more of the remaining drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b*. For example, movement of the drive chain in direction R**1** may activate or tension the cable end **2814***a* of the first drive cable **2810***a*, and thereby pull the first drive cable **2810***a*, while the cable connector **2807** associated with the second drive cable **2810***b* travels over the chain end of the second drive cable **2810***b* such that the drive chain **2804** fails to engage or activate (i.e., fails to push) the cable end **2814***b*. In other examples, however, one or more of the beads **2809** may be fixed to its respective cable connector **2807** to inhibit relative axial movement in both axial directions, such that the cable connector **2807** would impart compression (or push) on the associated drive cable.

Referring again to FIGS. **28**A and **28**B, the drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b* are each routed, from the drive chain **2804**, about one or more pulleys to the slide-out room **22**. In the illustrated example, each of the jamb assemblies **1410***a*,**1410***b* of the drive assembly **2800** includes a pair of cable guides **2818**,**2820**. Here, the first cable guide **2818** is mounted within an upper portion of the frame member **1420** proximate to the ceiling **32** of the slide-out unit **22** and the second cable guide **2820** is mounted within a lower portion of the frame member **1420** proximate to the floor of the slide-out unit **22**. Thus, the pair of cable guides **2818**,**2820** may be individually referred to as the upper cable guide **2818** and the lower cable guide **2820**. However, the pair of cable guides **2818**,**2820** may be differently arranged within the frame member **1420**. The pair of cable guides **2818**,**2820** may each be configured as double pulleys that permit independent actuation of the drive cables **2810**,**2812**, and may thus each include an individual or unique cable track for individually accommodating each of the drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b*; however, either or both of the pair of cable guides **2818**,**2820** may be differently configured, for example, as a pair of individual pulleys (i.e., single pulleys). Also in the illustrated example, a cable idler **2822** is provided to redirect the path of the drive cables **2810***b*,**2812***b*. Here, the cable idler **2822** is arranged within an upper portion of the frame member **1420**, proximate to the upper cable guide **2818**, but may be arranged elsewhere within the frame member **1420**, for example, at a lower portion thereof proximate to the lower cable guide **2820** to redirect the drive cables **2810***a*,**2812***a*, or at various other locations therebetween. The cable idler **2822** may also be configured as a double pulley, such that it may redirect and guide a pair of the drive cables **2810***b*,**2812***b*, without interference, rubbing, or friction between the drive cables **2810***b*,**2812***b*. In other examples, one or more additional cable idlers may be provided, whether as single and/or as double pulleys, to redirect or re-route one or more of drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b*. In the illustrated example, the pair of cable guides **2818**,**2820** and the cable idler **2822** are all attached to the web portion of the frame member **1420**; however, one or more of them may be mounted on a sidewall of the frame **1420**.

As illustrated, the chain ends of the first and second drive cables **2810***a*,**2812***b* are attached to the free end **2806***a* of the drive chain **2804**, and the opposing cable ends **2814***a*,**2814***b* associated therewith extend in opposite directions therefrom towards the opposing outer and inner sides, respectively, of the slide-out room **22**. The cable end **2814***a* of the first drive cable **2810***a* extends downward from the free end **2806***a* of the drive chain **2804**, towards a lower end of the frame member **1420**, around a first cable track of the lower cable guide **2820**, and outward from an outward facing opening in the frame member **1420**, towards the outer side of the slide-out room **22**. The cable end **2814***b* of the second drive cable **2810***b* extends upward from the free end **2806***a* of the drive chain **2804**, towards the upper end of the frame member **1420**, along a first cable track of the cable idler **2822**, over and around a first cable track of the upper cable guide **2818**, and outward from an inward facing opening in the frame member **1420**, towards the inner side of the slide-out room **22**.

Similarly, the chain ends of the first and second drive cables **2812***a*,**2812***b* are attached to the free end **2806***b* of the drive chain **2804**, and the opposing cable ends **2816***a*,**2816***b* associated therewith extend in opposite directions therefrom towards the opposing inner and outer sides, respectively, of the slide-out room **22**. The cable end **2816***a* of the first drive cable **2812***a* extends downward from the free end **2806***b* of the drive chain **2804**, towards the lower end of the frame member **1420**, around a second cable track of the lower cable guide **2820**, and outward from an inward facing opening in the frame member **1420**, towards the inner side of the slide-out room **22**. The cable end **2816***b* of the second drive cable **2812***b* extends upward from the free end **2806***b* of the drive chain **2804**, toward the upper end of the frame member **1420**, along a second cable track of the cable idler **2822**, over and around a second cable track of the upper cable guide **2818**, and outward from an outward facing opening in the frame member **1420**, towards the outer side of the slide-out room **22**.

Thus, the first and second drive cables **2810***a*,**2810***b* associated with the free end **2806***a* of the drive chain **2804** connect to opposite sides of the slide-out room **22**, and the first and second drive cables **2812***a*,**2812***b* associated with the opposing free end **2806***b* of the drive chain **2804** similarly connect to opposite sides of the slide-out room **22**. Also, the drive cables **2810***a*,**2810***b*,**2812***a*,**2812***b* may connect to the slide-out room **22** at various vertical dimensions along the slide-out room **22**. For example, the first and second drive cables **2810***a*,**2810***b* that connect to opposite sides of the slide-out room **22** are positioned at lower and upper ends, respectively, of the slide-out room **22**; and the first and second drive cables **2812***a*,**2812***b* that also connect to opposite sides of the slide-out room **22** are similarly attached at lower and upper ends of the slide-out room **22**. In the illustrated example, the cable end **2814***a* of the first drive cable **2810***a* connects to the outer lower corner A of the slide-out room **22**, the cable end **2816***a* of the (second) first drive cable **2812** connects to the inner lower corner B of the

slide-out room **22**, the cable end **2814***b* of the second drive cable **2810***b* connects to the inner upper corner D of the slide-out room **22**, and the cable end **2816***b* of the (second) second drive cable **2812***b* connects to the outer upper corner C of the slide-out room **22**; however, either or both of the cable ends **2814***a*,**2816***a* may instead be routed towards an upper corner (or upward from the lower end) of the slide-out room **22** and/or either or both of the cable ends **2814***b*,**2816***b* may instead be routed towards a lower corner (or downward from the upper end) of the slide-out room **22**).

The drive assembly **2800** generally operates as follows. The motor **2802** actuates the drive chain **2804** in the clockwise direction, causing the opposing free ends **2806***a*,**2806***b* to move in corresponding directions as indicated by arrow R**1**. This movement of the free end **2806***a* creates interference between the cable connector **2807** and the bead **2809** of the first drive cable **2810***a*, such that the free end **2806***a* tensions the first drive cable **2810***a* and pulls the slide-out room **22** in a first direction as indicated by arrow D**1**. The first drive cable **2810***a* is connected proximate to the outer lower corner A of the slide-out room **22**, and thus pulls the slide-out room **22** in the first direction D**1** from that outer lower corner A. The second first drive cable **2812***a* is connected to an opposite side of the slide-out room **22**, at the inner lower corner B, and the slide-out room **22** carries or pulls the first drive cable **2812***a* with it as it moves in the first direction D**1**, thereby activating or tensioning the first drive cable **2812***a*. Also, the first drive cable **2812***a* is connected relative to the second drive cable **2812***b*, such that they are pulled together. Here, for example, they are interconnected via a segment **2813** of chain at the free end **2806***b* of the drive chain **2804**. Thus, movement of the slide-out room **22** in this first direction D**1** engages or tensions the first drive cable **2812***a* (associated with the free end **2806***b*) at the inner lower corner B, which in turn engages or tensions the segment **2813** of chain at the free end **2806***b*, which in turn engages or tensions the second drive cable **2814***b* attached to the outer upper corner C of the slide-out room **22**. In this manner, the first cable **2812***a*, the segment **2813** of chain, and the second drive cable **2812***b* effectively operate as an individual drive cable, and together pull the slide-out room **22** in the first direction D**1**, in concert with the first drive cable **2810***a*.

In particular, the rotation of the drive chain **2804** moves the chain ends **2806***a*,**2806***b* in opposite directions. For example, rotation of the drive chain **2804** in a clockwise direction R**1** moves the chain ends **2806***a*,**2806***b* upward and downward directions, respectively. Here, the first drive cable **2810***a* is connected to the chain end **2806***a*, which pulls it in a corresponding direction D**1** to create tension in the first cable end **2814***a* to retract the slide-out room **22**. This rotation of the drive chain **2802**, however, may not pull the remaining drive cables **2810***b*,**2812***a*,**2812***b* to create tension in the corresponding cable ends **2814***b*,**2816***a*,**2816***b*. Similarly, opposite rotation of the drive chain **2804** pulls the first drive cable **2812***a* in a corresponding opposite direction to create tension in the first cable end **2816***a* to extend the slide-out room **22**. Thus, the drive chain **2804** may engage or tension just one of the first drive cable **2810***a* or the first drive cable **2812***a*, and then the slide-out room **22** may activate the remaining drive cables.

In the illustrated example, the cable end **2814***a* of the first drive cable **2810***a* is connected to a bracket positioned at the outer lower corner A of the slide-out room **22**, such that this rotation of the drive chain **2804** pulls (or moves) the slide-out room **22** in a first direction D**1** from the outer lower corner A. Also, the cable end **2814***b* of the second drive cable **2810***b* is connected to a bracket positioned at the inner upper corner D of the slide-out room **22**, such that the chain end **2806***a* of the drive chain **2804** pushes and/or provides slack to (or slackens) the second drive cable **2810***b* as the slide-out room **22** is pulled (or moved) in the first direction D**1** via the first cable end **2814***a*. Also, the cable end **2816***a* of the first drive cable **2812***a* is connected to a bracket positioned at the inner lower corner B of the slide-out room **22**, on an opposite side of the slide-out room **22** from the outer lower corner A, such that the slide-out room **22** pulls the drive cable **2812***a* as it moves in the first direction D**1**, thereby tensioning the second drive cable **2812***b* which is secured relative to the first drive cable **2812***a*. Here, the cable end **2816***b* of the second drive cable **2812***b* is connected to a bracket positioned at the outer upper corner C of the slide-out room **22** and movement of the slide-out room **22** in the first direction D**1**, via the first drive cable **2810***a*, tensions the first and second drive cables **2812***a*,**2812***b* to pull the slide-out room **22** at the outer upper corner C in the first direction D**1**. Thus, rotation of the drive chain **2804** engages (or tensions) the first drive cable **2810***a* to pull (or move) the slide-out room **22** in the first direction D**1**, and the resulting movement of the slide-out room **22** in the first direction D**1** engages the second drive cable **2812***b* to also pull (or move) the slide-out room **22** in the first direction D**1**. Similarly, rotation of the drive chain **2804** in the opposite direction engages (or tensions) the first drive cable **2812***a* to pull (or move) the slide-out room **22** in a second direction (that is opposite the first direction D**1**), and the resulting movement of the slide-out room **22** in the second direction engages the second drive cable **2810***b* to also pull (or move) the slide-out room **22** in the second direction.

Depending on where the cable end **2814***a* of the drive cable **2810***a* is connected on the outer surface of the slide-out room **22** (e.g., at the outer lower or outer upper corner A,C, or there-between), the inner surface of the slide-out room **22** may or may not move evenly, for example, the inner lower corner B of the slide-out room **22** may move a different amount (and/or differently) at the inner lower corner B. But for the slide-out room **22** engaging one or more of the remaining drive cables, this may otherwise result in tipping (or rocking, tilting, etc.) of the slide-out room **22**, because the chain end **2806***a* of the drive chain **2804** pushing (or moving, carrying, etc.) the cable end **2814***b* of the drive cable **2810***b* may fail to generate (or be incapable of generating) sufficient force to move the inner upper corner D of the slide-out room **22** in unison with the inner lower corner B; and, similarly, the chain end **2806***b* of the drive chain **2804** pushing (or moving, carrying, etc.) the drive cable **2812***b* in this direction may otherwise fail to generate (or be incapable of generating) sufficient tension in the cable end **2816***b* of the drive cable **2812***b* to pull the outer upper corner C of the slide-out room **22** in unison with the inner lower corner B. Thus, when activating the cable end **2814***a* via the drive chain **2804** to pull the outer lower corner A of the slide-out room **22** in the first direction D**1**, driven rotation of the drive chain **2804** may cause no movement of the outer upper corner C of the slide-out room **22** or may cause movement (or travel) in the first direction D**1** less than the outer lower corner A; and, moreover, driven rotation of the drive chain **2804** may otherwise cause the outer upper corner C of the slide-out room **22** to move (or travel) in the first direction D**1** less than the inner lower corner B, resulting in the inner lower corner B engaging (or tensioning) the drive cables **2812***a*,**2812***b* to pull the outer upper corner C of the slide-out room **22** simultaneously with the outer lower corner A. Accordingly, the drive assembly **2800** may be

configured to deploy the slide-out room **22** into its extended and retracted positions with a desired orientation and/or be configured to adjust orientation of the slide-out room **22** during deployment of the same.

The drive assembly **2800** cycles the drive chain **2804** to pull or engage just one drive cable **2810***a*,**2810***b*,**2812***a*, **2812***b*. This causes movement of the slide-out room **22**, which in turn activates the remaining drive cables **2810***a*, **2810***b*,**2812***a*,**2812***b*. Thus, all of the drive cables **2810***a*, **2810***b*,**2812***a*,**2812***b* are activated by pulling just one of them, which moves the slide-out room **22** at one corner and sets the remaining corners of the slide-out room **22** in motion.

FIGS. **29**A-**29**C illustrate an alternate drive assembly **2900**, according to one or more alternate embodiments. With reference to FIGS. **29**A-**29**B, the drive assembly **2900** may be incorporated into the left and right jamb assemblies **1410***a*,**1410***a*s previously described with regard to the drive assembly **2800** of FIGS. **28**A and **28**B. Thus, as to each of the jamb assemblies **1410***a*,**1410***b*, the drive assembly **2900** includes a motor **2902** and a drive chain **2904**. A drive sprocket (obscured from view) is operatively coupled to the motor **2902**, and the drive chain **2904** extends around and engages the teeth of the drive sprocket, such that the motor **2902** may impart torque on the drive sprocket, causing it to rotate and drive or move the drive chain **2904**. Also, an idler sprocket **2906** may be provided in each of the opposing jamb assemblies **1410***a,b* for guiding and maintaining orientation of the drive chain **2904** as it is actuated by the drive sprocket of the motor **2902**. Here, the drive chain **2904** is provided as a continuous (or closed) segment or loop of chain arranged around the drive sprocket and the idler sprocket **2906** to maintain engagement with the drive sprocket as it rotates in either direction, such that the drive chain **2904** transmits power to the idler sprocket **2906** so that the idler sprocket **2906** rotates with the drive sprocket.

As illustrated, a timing shaft **2908** may extend between and interconnects the idler sprockets **2906** of the opposing jamb assemblies **1410***a,b*, such that they rotate in unison and operation of the drive assembly **2900** within each of the opposing jamb assemblies **1410***a,b* is synchronized or timed together. However, other mechanical timing mechanisms and/or non-mechanical timing systems may be utilized in addition to or in lieu of the foregoing. Also, it will be appreciated that the timing shaft **2908** (or other timing mechanism) may be provided at various locations about the slide-out room **22**, for example, across a top side of the slide-out room **22**, along a bottom side thereof, or along a sidewall thereof depending on the location about the slide-out room **22** that the drive assembly **2900** is oriented. Thus, the drive assembly **2900** is a variation of the drive assembly **2800** of FIGS. **28**A-**28**C, wherein the motor **2902** is positioned at a lower side of the slide-out room **22** to permit configuration of the timing shaft **2908** across an upper side of the slide-out room **22**. However, the timing shaft **2908** may be provided along a lower side of the slide-out room **22** in other examples.

FIG. **29**C illustrates a close up view of a central portion of the drive chain **2904**, according to one or more examples. Here, the drive chain **2904** is configured as a continuous chain, or closed loop of chain, and is thus connected at its free ends **2906***a*,**2906***b*. Here, for example, the drive chain **2904** is adjustably connected at free ends **2906***a*,**2906***b* via an adjustable chain connector **2907**. Also, a pair of first drive cables **2910***a*,**2910***b* and a pair of second drive cables **2912***a*,**2912***b* are secured relative to the drive cable **2904**. The drive cables **2910***a*,**2910***b*,**2912***a*,**2912***b* may be adjustably connected to the drive chain **2904**, or otherwise connected to the drive chain **2904**. Here, the drive cables **2910***a*,**2910***b*,**2912***a*,**2912***b* each include an integral bead or stop member **2909** received within a cable chain connector **2911** configured to permit both rotation of the drive cables **2910***a*,**2910***b*,**2912***a*,**2912***b* within the cable chain connector **2911** as well as axial translation of the drive cables **2910***a*, **2910***b*,**2912***a*,**2912***b* through the cable chain connector **2911** until the bead **2909** contacts the cable chain connector **2911**. In other examples, the drive cables **2910***a*,**2910***b*,**2912***a*, **2912***b* may be adjustably connected to the drive chain **2904**.

Returning to FIGS. **29**A-**29**B, the drive cables **2910***a*, **2910***b*,**2912***a*,**2912***b* are each connected to a bracket positioned on the slide-out room **22** at an outer lower corner A, inner lower corner B, outer upper corner C, and inner upper corner D, respectively, of the slide-out room **22**. Rotation of the drive chain **2904** in either direction pulls or tensions one of the drive cables **2910***a*,**2910***b*,**2912***a*,**2912***b*, which pulls the slide-out room **22**, and this movement of the slide-out room **22** activates the remaining drive cables **2910***a*,**2910***b*, **2912***a*,**2912***b*. For example, rotation or cycling of the drive chain **2904** in a direction indicated by R**1** tensions the first drive cable **2910***a*, such that the drive cable **2904** pulls the first drive cable **2910***a* causing the outer lower corner A of the slide-out room **22** to move in the first direction D**1**. This movement of the slide-out room **22** causes the inner lower corner B of the slide-out room **22** to move in the first direction D**1** with the outer lower corner A being pulled by the first drive cable **2910***a*. The first drive cable **2912***a* is attached at the inner lower corner B of the slide-out room **22** and, at its other end, is fixed relative to the second drive cable **2912***b* (e.g., through the drive chain **2904**) such that tensioning of the drive cable **2912***a* activates or tensions the second drive cable **2912***b* that is connected to the outer upper corner C. Thus, the slide-out room **22** activates or tensions the drive cables **2912***a*,**2912***b* to pull the outer upper corner C of the slide-out room **22** as the drive chain **2904** activates or tensions the first drive cable **2910***a* to pull the outer lower corner A. Similarly, reverse operation of the drive chain **2904** would cause tensioning of the first drive cable **2912***a* to pull the inner lower corner B of the slide-out room in an opposite direction, which movement of the slide-out room **22** thereby tensions the drive cables **2910***a*,**2910***b* interconnecting the outer lower corner A and the inner upper corner D to pull the slide-out room **22** at the inner upper corner D.

The slide-out room **22** may be balanced in a specific orientation during its extension or retraction. For example, the slide-out room **22** may be balanced in an orientation where the forward or outside wall **38** of the slide-out room **22** is parallel to the side **16** of the vehicle **10** and/or where the floor of the slide-out room **22** is parallel to the floor of the vehicle **10**. In some examples, the slide-out room **22** is balanced on one or more rollers or bars that are secured to the vehicle **10**. For example, the bottom jamb **20** of the opening **18**, which is positioned proximate to the floor of the slide-out room **22**, may include one or more rollers or bars on which the slide-out room **22** may be balanced in a constant orientation as it slides between its fully extended and retracted positions. In some examples, the roller(s) or bars or other balancing means may be positioned on the jambs **20** positioned next to the sidewalls **34**,**36** of the slide-out room **22**. Regardless of whether any such rollers or bars are utilized and the location at which they are positioned about the opening **18** relative the slide-out room **22**, the drive mechanisms disclosed herein (e.g., the drive assembly **2800**,**2900**) may balance the slide-out room **22** in a specific orientation, and maintain the slide-out room **22** in

that specific orientation, as the drive cables are actuated to move the slide-out room **22**. Thus, the slide-out room **22** may maintain constant orientation as the drive cables pull it in either a first or second direction. In one examples, one or more of the drive cables pull the slide-out room **22** in a first direction towards and into its fully extended position in a manner that the floor of the slide-out room **22** maintains its orientation (e.g., parallel to the floor of the vehicle) during the entire time that it is moved in the first direction. Similarly, one or more of the drive cables will maintain that orientation of the slide-out room **22** and balance the slide-out room **22** as they pull the slide-out room **22** in the second direction towards and into its fully retracted position. Thus, the drive cables may balance the slide-out room **22** in a particular orientation as they actuate the slide-out room **22** in either the first direction or the second direction. Also, in this example one or more rollers, balancing members, or wear strips (or wear bars) may be positioned about the opening **18** in the vehicle **10** for at least partially supporting the slide-out room **22** as the drive out cables balance and actuate the slide-out room **22** in the first direction and/or second direction. The wear strip comprise a strip of plastic with a slick surface and which may operate as a seal too.

FIGS. **30**A-**30**G illustrate various cable-chain adjusters configured to adjust tension of the drive cables and/or the drive chain, according various embodiments. The cable-chain adjusters illustrated in FIGS. **30**A-**30**G, which are sometimes referred to as connectors, adjustably connect one or more drive chains **3000** to one or more drive cables **3002**, and may be utilized with various slide-out drive assemblies, such as those described herein. The connecters described with reference to FIGS. **30**A-**30**G may be utilized within jamb frames or elsewhere about the vehicle, such as beneath the slide-out room **22**.

FIG. **30**A illustrates a connector **3004** that interconnects a pair of drive chains **3000***a*,**3000***b* and actuates a pair of drive cables **3002***a*,**3002***b*, according to one or more embodiments. The connector **3004** may be utilized in a variety of slide-out drive assemblies, and, in some examples, a pair of the connectors **3004** may be utilized within a jamb mounted slide out drive assembly. A first drive cable **3002***a* extends from one end of the connector **3004** and a second drive cable **3002***b* extends from a second opposite end of the connector **3004**. Here, the pair of drive chains **3000***a*,**3000***b* are strands of chains having chain ends, and each chain ends of each drive chain **3000***a*,**3000***b* is connected to a separate connector **3004**. Thus, drive chains **3000***a*,**3000***b* and the pair of the connectors **3004** form an endless loop that may rotate within a jamb assembly and that may be driven to actuate the drive cables **3002** extending from the jamb assembly. Each of the connectors **3004** may be formed from a pair of U-shaped members that are fastened together. Each drive cable **3002** includes a stud **3006** that extends through an aperture **3008** formed in each stamped U-shaped member and secured from an interior portion of the connector **3004** via a nut **3010**. The stud **3006** may include a threaded portion that is inserted within and corresponds with a threaded bore portion of the nut **3010**, and axially translates therein upon rotation of the nut **3010**. In addition, the drive cables **3002***a*,**3002***b* may be adjustable with respect to the connector **3004**, for example, via a stud **3012** having a threaded portion that axially translates within a threaded bore of a nut **3014** upon rotation of the nut **3014**. Either or both of the nuts **3008**,**3014** may be configured to inhibit it from "backing off" its respective stud **3006**,**3012** after being tightened. For example, the nuts **3008**,**3014** may include spring lock washers that help lock the nuts **3008**,**3014** in place and inhibit loosening due to vibration. The U-shaped members that together define the connector **3004** may be stamped and may be secured together via a variety of means, including welding and/or fasteners. In the illustrated example, the U-shaped members are held together via the studs **3006**,**3012**. In some examples, a locking device such as a lock washer is provided in-between the U-shaped members and aligned with the apertures through which the studs **3006**,**3012** are inserted.

FIG. **30**B illustrates an alternate connector **3020** that is spliced within the drive chain **3000** and actuates four (4) drive cables **3002***a*,**3002***b*,**3002***c*,**3002***d*, according to one or more embodiments. The connector **3020** is similar to the connector **3004** of FIG. **30**A, except that it is utilized with a single drive chain **3000**, interconnecting opposing ends thereof to form an endless loop within a jamb assembly, and is adjustably attached to four (4) drive cables **3002***a*,**3002***b*, **3002***c*,**3002***d*, such that rotation of the drive cable **3000** activates all four (4) drive cables **3002***a*,**3002***b*,**3002***c*, **3002***d*. The connector **3020** may be utilized in a variety of slide-out drive assemblies, and, in the illustrated example, is utilized within a jamb mounted slide out drive assembly.

FIG. **30**C illustrates an alternate connector **3030** interconnecting the pair of drive chains **3000***a*,**3000***b* and actuates a pair of drive cables **3002***a*,**3002***b*, according to one or more embodiments. As described with reference to FIG. **30**, the pair of drive chains **3000***a*,**3000***b* are strands of chains and a pair of the connectors **3030** are utilized to splice the drive chains **3000***a*,**3000***b* together, thereby forming an endless loop within a jamb assembly that may be driven to actuate the drive cables **3002**. Thus, the connector **3030** is similar to the connector **3004** of FIG. **30**A, except that the connector **3030** provides greater adjustment of the drive cables **3002** in a relatively smaller envelope due to extension portions to which the drive cables **3002***a*,**3002***b* are connected. Here, each of the U-shaped members that are held together to form the connector **3030** include a pair of oppositely extending chain connector portions such that, when the U-shaped members are assembled together as illustrated and described herein, the oppositely extending chain connector portions overlap and define the extension portions to which the ends of the drive chains **3000***a*,**3000***b* are attached. In the illustrated example, the U-shaped members are held together via the studs of the drive cables and/or drive chains **3000***a*, **3000***b*. Also in the illustrated example, the nuts that are utilized to adjust tension in the drive cables **3002** are provided exterior an internal space of the connector **3030**, proximate to the extension portion. Thus, the amount of travel of the stud is not limited by the amount of travel permitted within the internal space of the connector **3030**, but, rather, the stud may translate through the **3030** and be adjusted to numerous lengths without obstruction from the body of the connector **3030**. The connector **3030** may be utilized in a variety of slide-out drive assemblies, and, in the illustrated example, is utilized within a jamb mounted slide out drive assembly.

FIG. **30**D illustrates an alternate connector **3040** that is spliced within the drive chain **3000** and actuates four (4) drive cables **3002***a*,**3002***b*,**3002***c*,**3002***d*, according to one or more embodiments. The connector **3040** is similar to the connector **3030** of FIG. **30**C, except that just one connector **3040** is utilized with a single drive chain **3000**, interconnecting opposing ends of the drive chain **3000** to form an endless loop within the jamb assembly, and is adjustably attached to four (4) drive cables **3002***a*,**3002***b*,**3002***c*,**3002***d*, such that rotation of the drive cable **3000** activates all four (4) drive cables **3002***a*,**3002***b*,**3002***c*,**3002***d*. The connector **3040** may be utilized in a variety of slide-out drive assem-

blies, and, in the illustrated example, is utilized within a jamb mounted slide out drive assembly.

FIGS. **30**E and **30**F illustrate a connector **3050** configured to attach to an end of the drive chain **3000**, according to various embodiments. Unlike the connectors described with reference to FIGS. **30**A-**30**F, the connector **3050** does not splice together two separate strands of the chain **3000**. Rather, the drive chain **3000** is configured as a strand in these examples, and the connector **3050** is attached at a first end of the strand (of drive chain **3000**) and a second connector (not illustrated) is attached at a second end of the strand (of drive chain **3000**). In addition, a second drive chain (not illustrated) with a second pair of connectors **3050** may be provided to actuate drive cables (not illustrated) attached to a second side of the slide-out room **22**. Here, each of the drive cables **3002***a*,**3002***b* includes a stud having a threaded portion, and the threaded portions of the studs extend through apertures in the connector **3050**. The threaded portions of the studs extend into and through lock nuts, which may be rotated to cause linear translation of the stud through the apertures and relative to the connector **3050**. Thus, the tension in the drive cables **3002** may be adjusted by rotating the lock nuts.

FIG. **30**F illustrates an example of the connector **3050** having an anti-vibration device **3060** that inhibits the lock nut from rattling loose or backing off. Here, the anti-vibration device **3060** is foam block provided over the lock nut. The anti-vibration device may be made of various other materials, however, such as various elastomeric materials, etc. In other examples, the anti-vibration device is differently arranged relative the lock nut, for example, in between the lock nut and the connector **3050**.

FIG. **30**G illustrates another example connector **3070** for adjusting the drive cable **3002** relative to the drive chain **3000**, according to one or more examples. In this example, the drive chain **3000** is continuous and thus provided as a loop. The drive chain **3000** may be provided within jamb assemblies arranged about opposite sides of the opening **18**, and driven therein via one or more drive sprockets also arranged within the jamb assemblies. The connector **3070** includes a pair of opposing plates **3072**,**3074** that may be pinned together through one or more links of the drive chain **3000**. A cable mount **3076** having an aperture **3078** extending there-through is secured to one of the opposing plates **3072**,**3074** (e.g., the plate **3074**). Each of the drive cables **3002** includes a stud **3080** and at least a portion of the stud **3080** is threaded. The stud **3080** extends through the aperture **3078** of the cable mount **3076**, from a first side of the aperture **3078** to a second side of the aperture **3078**, and through a correspondingly threaded bore of a nut **3082** that is arranged proximate to the second side of the aperture **3078**. The nut **3082** may be rotated to cause translation of the stud **3080** relative to the cable mount **3076** and through the threaded bore of the nut **3082**.

In some examples, the stud **3080** includes at least one flat **3090** and a bore of the aperture **3078** (of the cable mount **3076**) through which the stud **3080** extends includes at least one corresponding flat **3092**. In the illustrated example, the stud **3080** includes a pair of oppositely disposed flats **3090** that correspond with a pair of oppositely disposed flats **3092** within the aperture **3078**. The corresponding flats **3090**,**3092** are flat surfaces that abut each other as the stud **3080** translates axially within the bore of the cable mount **3076** and inhibit relative rotation between the studs **3080** and the cable mount **3076** due to interference between the corresponding flats **3090**,**3092**. Thus, the flats **3090** on the studs **3080** may be provided without threads, which are otherwise provided on the stud **3080**, such that rotation of the nut **3082** engages the threaded portions of the stud **3080** while permitting the nut **3082** to rotate over the flats **3090** of the stud **3080** without interference.

FIGS. **31**A-**31**D illustrate a bracket **3100** (sometimes referred to as a stand-off bracket) configured for adjustably connecting a drive cable **3102** to the slide-out room **22**, according to one or more embodiments. As hereinafter described, the bracket **3100** permits adjustment of a cable drive slide-out assembly, for example, drive assemblies **2800** and/or **2900**, outside of the jamb assemblies **1410***a*, **1410***b*.

As illustrated, the bracket **3100** includes a base **3104** configured to be secured to the slide-out room **22**, for example, on the left sidewall **34** and/or the right sidewall **36**. Accordingly, a plurality of mounting holes **3406** may be provided in the base **3104**. In the illustrated example, the mounting holes **3406** are symmetrically provided in the base **3104** relative to a central axis L; however, they may be provided in various other configurations, symmetrical or otherwise, in other examples.

The bracket **3100** also includes a stand-off portion **3110** configured to protrude outward from the slide-out room **22** and receive the drive cable **3102** at a location relative to the sidewall of the slide-out room **22** that provides ample room or space for a user to adjust the tension of the drive cable **3102**. The stand-off portion **3110** may include a plurality of holes or recesses. Here, the stand-off portion **3110** includes a pair of insert recesses **3112** symmetrically disposed relative to the central axis L; however, they may be provided in various other configurations, symmetrical or otherwise, in other examples. Also, the stand-off portion **3110** includes a pair of cable end recesses **3114** for receiving the drive cable **3102** or a threaded stud **3116** thereof. Here, the cable end recesses **3114** are provided on the top and bottom of the stand-off portion **3110**, symmetrical relative to the central axis L; however, they may be provided on either the top or bottom of the stand-off portion **3110** in other examples. In the illustrated example, the threaded stud **3116** is shown extending through the cable end recess **3114** provided in the bottom of the stand-off portion **3110**, such that a nut **3118** may receive the threaded stud **3116** exterior the stand-off portion **3110** and be rotated to adjust tension in the drive cable **3102**. Here, the nut **3118** abuts a leg or flange **3119** of the stand-off portion **3110** when engaging the threaded stud **3116** extending through the cable end recess **3114** defined in the flange **3119**.

The bracket **3100** also includes an insert **3120** arranged within the stand-off portion **3110**. The insert **3120** is configured to receive the drive cable **3102** and redirect it towards the cable end recesses **3114** without damaging or weakening the drive cable **3102**. For example, without the insert **3120**, the drive cable **3102** would abut the stand-off portion **3110** and be re-routed or directed at a sharp angle, which may damage or otherwise weaken the drive cable **3102**. Here, the insert **3120** is made of a plastic material and includes a radiused channel **3121** configured to receive the drive cable **3102** and redirect it towards the cable end recesses **3114** without stressing or damaging the drive cable **3102**. For example, the radiused channel **3121** is configured to ensure that the drive cable **3102** is not subject to a ninety degree bend, which may cause damage over time to the drive cable **3102**. In one example, the radiused channel **3121** includes a three-quarter inch radius cable channel; however, various other dimensions may be provided, for example, depending on the material of the drive cable **3102**, without departing from the present disclosure.

The insert **3120** includes a face portion **3122** arranged within the insert recesses **3112**. Also, a channel or recess **3124** is provided in the face portion **3122** for receiving the drive cable **3102**. The recess **3124** extends through the face portion **3122** and into the radiused channel **3121**, such that the drive cable **3102** may extend there-through and be redirected towards the cable end recess **3114** via the radiused channel **3121**. In some examples, the insert **3120** is configured to self-align with the drive cables **3102** extending into the recess **3124**. Here, the face portion **3122** is slightly smaller than the insert recesses **3112** such that it, and the insert **3120**, may move side to side within the insert recesses **3112** relative to the stand-off portion **3110** (i.e., towards or away from the slide-out room **22**) and thus align with the orientation of the drive cable **3102** extending from the jamb assembly **1410**.

In some examples, the insert **3120** is secured within the insert recess **3112**. In some of these examples, the insert **3120** may clip into the insert recess **3112** such that all relative movement between the insert **3120** and the stand-off portion **3110** is inhibited. However, in other of these examples, the insert **3120** may be secured within the insert recess **3112** in a manner permitting side-to-side movement (or sliding) of the insert **3120** within the insert recess **3112** and thereby permit self-alignment of the insert **3120** relative to the drive cable **3102** extending from the jamb assembly **1410**.

FIGS. **32**A-**32**B illustrate alternate examples of the bracket **3100** of FIGS. **31**A-**31**D, according to one or more alternate embodiments. Here, stand-off portion **3110** includes a single insert recess **3112** and a single cable end recess **3114**, provided at opposite ends of the stand-off portion **3110**. Here, for example, a single insert recess **3112** is provided proximate to the bottom side of the stand-off portion **3110** and the cable end recesses **3114** is provided at the top side of the stand-off portion **3110**; however, they may be provided differently. For example, a single insert recess **3112** may be provided at the top side of the stand-off portion **3110** and the cable end recesses **3114** may be provided at the bottom side of the stand-off portion **3110**. Also in the illustrated example, the insert recess **3112** may define a pair of angled surfaces **3202**, and the face portion **3122** of the insert **3120** may include a pair of correspondingly angled surfaces **3204** that abut the angled surfaces **3202** when the insert **3120** is assembled within the stand-off portion **3110**. Also in the illustrated example, the insert **3120** includes a single radiused channel **3121**, but it may instead include a pair of radiused channels **3121** as illustrated in FIGS. **31**A-**31**D.

FIGS. **33**A-**33**B illustrate alternate brackets **3300** (i.e., a stand-off bracket) configured for adjustably connecting a drive cable **3302** to the slide-out room **22**, according to one or more alternate embodiments. As hereinafter described, the bracket **3300** permits adjustment of a cable drive slide-out assembly, for example, drive assemblies **2800** and/or **2900**, outside of the jamb assemblies **1410***a*,**1410***b*.

The bracket **3300** includes a base **3304** and a stand-off portion **3306**. The base **3304** is configured to mount on the slide-out unit **22** and the stand-off portion **3306** is configured to receive an end **3308** of the drive cable **3302**. Here, the stand-off portion **3308** includes an aperture or recess **3309** through which the end **3308** of the drive cable **3302** extends. In the illustrated example, the recess **3309** is sized and shaped to permit movement of the end **3308** of the drive cable **3302** and alignment of the end **3308** of the drive cable **3302** with the drive cable **3302** extending from the jamb assembly **1410**. In other examples, however, the recess **3309** is sized and shaped approximately the same as the end **3308** of the drive cable **3308**, thereby inhibiting relative movement of the end **3308** of the drive cable **3302** within the recess **3309**.

As illustrated, a cable adjustment assembly **3320** is provided on the end **3308** of the drive cable **3302**. As hereinafter described, the cable adjustment assembly **3320** is configured to permit tensioning of the drive cable **3302** without having to substantially disassemble the drive assembly and/or access the drive cable **3302** from within the jamb assembly **1410**. In some examples, the cable adjustment assembly **3320** includes a disk **3322** having a shank **3324** integrally extending therefrom. The shank **3324** may include a threaded bore (obscured from view) extending there-through. Here, the recess **3309** is sized and shaped to inhibit the disk **3322** from being pulled there-through.

The cable adjustment assembly **3320** may also include a stop or bead **3326** fixed on the end **3308** of the drive cable **3302** and an externally threaded collar **3328** rotatably arranged over the bead **3326**. Also, the cable adjustment assembly includes a nut **3330** fixed to the externally threaded collar **3328** and configured to permit a user to rotate the externally threaded collar **3328**. The externally threaded collar **3328** is coupled to the end **3308** of the drive cable **3302** to permit relative rotation there-between. Here, the externally threaded collar **3328** is configured to rotate about the bead **3326**, whereas relative axial movement there-between is inhibited in at least one direction. The threads of the externally threaded collar **3328** correspond with the threads with the bore of the shank **3324** such that relative rotation between the shank **3324** and the externally threaded collar **3328** causes relative axial movement between the shank **3324** and the externally threaded collar **3328**.

As mentioned, the externally threaded collar **3328** includes a bore that receives the bead **3326** and inhibits at least some relative axial movement therebetween. Here, the externally threaded collar **3328** is configured to inhibit the drive cable **3302** pulling the bead **3326** out of the externally threaded collar **3328** in a direction away from the disk **3322**; and, in some examples, the externally threaded collar **3328** is also configured to inhibit the drive cable **3302** pushing the bead **3326** out of the externally threaded collar **3328** in a direction towards the disk **3322**. Thus, the bore of the externally threaded collar **3328** may be stepped (i.e., include a larger diameter portion and a smaller diameter portion) to retain the bead **3326** of the drive cable **3302** within the bore of the externally threaded collar **3328** as the externally threaded collar **3328** is rotated to adjust tension in the drive cable **3302**. For example, the drive cable **3302** may have a smaller diameter than the bead **3326** fixed thereon, and the bore of the externally threaded collar **3328** may have a larger diameter portion positioned away from the cable end **3308** and sized to receive the bead **3326**; and the bore of the externally threaded collar **3328** may also include a smaller diameter portion that is positioned towards the end **3308** of the drive cable **3302** and sized to receive the end **3308** of the drive cable **3302**, but sized too small to permit the bead **3326** from being pulled there-through when the externally threaded collar **3328** is threaded within the threaded bore of the shank **3324**. Upon pulling of the drive cable **3302**, the bead **3306** is pulled into contact with a step (obscured from view) within the bore of the externally threaded collar **3328**, and this interference between the smaller diameter portion of the externally threaded collar **3328** and the bead **3326** inhibits the bead **3326** from being pulled out of the externally threaded collar **3328**.

FIGS. **34**A-**34**C and **35**A-**35**C illustrate various examples of the cable adjustment assembly **3320**, according to various examples of the present disclosure. As illustrated in FIGS. **34**A-**34**C, the externally threaded collar **3328** and the nut **3330** integrally provided thereon may be provided as a solid unit with a bore **3400** extending there-through, but without any other recesses or gaps. As mentioned, the bore **3400** extending through the externally threaded collar **3328** may include a step (obscured from view) that interferes with the bead **3326** when the drive cable **3302** is pulled, thereby pulling the externally threaded collar **3328** with the end **3308** of the drive cable **3302**. FIGS. **34**A-**34**C illustrate an example where the externally threaded collar **3328** and the nut **3330** integrally provided thereon include a gap **3500**. Here, the gap **3500** is oriented along and extends into a bore **3502** of the externally threaded collar **3328**, and may permit the externally threaded collar **3328** and the nut **3330** to be press fit onto the drive cable **3302** without any disassembly of the jam assembly **1410**, rather than having to thread them onto the drive cable **3302** which may require disassembly of the jamb assembly **1410** to access the other end of the drive cable **3302**. Also, FIGS. **35**A-**35**C illustrate the externally threaded collar **3328** including a step feature **3504** that separates a larger diameter portion **3506** of the bore **3502** and a smaller diameter portion **3508** of the bore **3502**, with the larger portion **3506** configured to receive the bead **3326**, the smaller portion **3508** configured to receive the end **3308** of the drive cable **3302**, and the step feature **3504** inhibiting axial movement of the bead **3326** when the drive cable **3302** is pulled. Accordingly, a user may adjust tension in the drive cable **3302** via rotating the externally threaded collar **3328**. In the illustrated examples, the user may utilize a tool to rotate the nut **3330** fixed to the externally threaded collar **3328**.

The present subject matter affords a simple and reliable slide-out drive assembly and/or mechanism for a slide-out unit such as a slide-out room **22** or slide-out compartment **26**. This slide-out drive assembly and/or mechanism is simpler and more reliable than other slide-out drive systems that are presently known. The drive mechanism of the present subject matter assures that the slide-out unit will advance and retract smoothly and evenly, whether power is applied manually or with a motor. Because of the simplicity of the present drive mechanism, there is less that can go wrong than is the case with presently known slide-out operating systems.

Therefore, the disclosed systems and methods are well adapted to attain the ends and advantages mentioned as well as those that are inherent therein. The particular embodiments disclosed above are illustrative only, as the teachings of the present disclosure may be modified and practiced in different but equivalent manners apparent to those skilled in the art having the benefit of the teachings herein. Furthermore, no limitations are intended to the details of construction or design herein shown, other than as described in the claims below. It is therefore evident that the particular illustrative embodiments disclosed above may be altered, combined, or modified and all such variations are considered within the scope of the present disclosure. The systems and methods illustratively disclosed herein may suitably be practiced in the absence of any element that is not specifically disclosed herein and/or any optional element disclosed herein. While compositions and methods are described in terms of "comprising," "containing," or "including" various components or steps, the compositions and methods can also "consist essentially of" or "consist of" the various components and steps. All numbers and ranges disclosed above may vary by some amount. Whenever a numerical range with a lower limit and an upper limit is disclosed, any number and any included range falling within the range is specifically disclosed. In particular, every range of values (of the form, "from about a to about b," or, equivalently, "from approximately a to b," or, equivalently, "from approximately a-b") disclosed herein is to be understood to set forth every number and range encompassed within the broader range of values. Also, the terms in the claims have their plain, ordinary meaning unless otherwise explicitly and clearly defined by the patentee. Moreover, the indefinite articles "a" or "an," as used in the claims, are defined herein to mean one or more than one of the elements that it introduces. If there is any conflict in the usages of a word or term in this specification and one or more patent or other documents that may be incorporated herein by reference, the definitions that are consistent with this specification should be adopted.

Use of directional terms such as above, below, upper, lower, upward, downward, left, right, and the like are used in relation to the illustrative embodiments as they are depicted in the figures, the upward or upper direction being toward the top of the corresponding figure and the downward or lower direction being toward the bottom of the corresponding figure.

As used herein, the phrase "at least one of" preceding a series of items, with the terms "and" or "or" to separate any of the items, modifies the list as a whole, rather than each member of the list (i.e., each item). The phrase "at least one of" allows a meaning that includes at least one of any one of the items, and/or at least one of any combination of the items, and/or at least one of each of the items. By way of example, the phrases "at least one of A, B, and C" or "at least one of A, B, or C" each refer to only A, only B, or only C; any combination of A, B, and C; and/or at least one of each of A, B, and C.

What is claimed is:

1. A slidable room drive assembly for a vehicle having a plurality of exterior walls, at least one of which has an opening, and a slide-out room having a pair of opposing sidewalls disposed in the opening and reciprocable between an extended position and a retracted position, the slidable room drive assembly comprising:

a pair of jamb members arranged about the opening in the vehicle proximate to the opposing sidewalls of the slide-out room, each of the jamb members having a sprocket and a drive chain at least partially provided around the sprocket and actuatable in a first or second rotational direction by the sprocket, each of the drive chains being an open strand of chain with a first and second loose end extending from the sprocket such that the strand of chain has a U-shaped orientation when engaging the sprocket; and

a plurality of drive cables within each jamb member, including:

a first cable connected to the first loose end of the drive chain and extending from the jamb member to the front end of the slide-out room,

a second cable connected to the first loose end of the drive chain and extending from the jamb member to the rear end of the slide-out room,

a third cable connected to the second loose end of the drive chain and extending from the jamb member to the front end of the slide-out room, and

a fourth cable connected to the second loose end of the drive chain and extending from the jamb member to the rear end of the slide-out room;

wherein within each jamb member, the first cable extends from the first loose end in a direction opposite of the second cable, the first cable and the second cable extending along a first common line;

wherein within each jamb member, the third cable extends from the second loose end in a direction opposite of the forth cable, the third cable and forth cable extending along a second common line;

wherein actuation of the drive chain in the first rotational direction tensions the first cable to pull the slide-out room from the front end and thereby move the slide-out room in a first direction, and movement of the slide-out room in the first direction thereby tensions the fourth cable and the third cable to further pull the slide-out room from the front end.

2. The slidable room assembly of claim **1**, further comprising a motor arranged in each of the jamb members to actuate the respective drive chain, wherein the motors in the jamb members are mechanically timed.

3. The slidable room assembly of claim **1**, further comprising a motor arranged in each of the jamb members to actuate the respective drive chain, wherein the motors in the jamb members are electronically timed with a controller.

4. The slidable room assembly of claim **3**, wherein the controller monitors back EMF generated in the motors in each of the jamb members and compares the back EMF in the motors to thereby control either or both of the motors.

5. The slideable room assembly of claim **1**, wherein the first and second drive cables are a unitary cable strand and/or the third and the fourth drive cables are a separate unitary strand of cable.

6. The slideable room assembly of claim **1**, wherein:

the first cable is connected to the slide-out room proximate to a lower corner at the front end of the slide-out room;

the second cable is connected to the slide-out room proximate to an upper corner at the rear end of the slide-out room;

the third cable is connected to the slide-out room proximate to an upper corner at the front end of the slide-out room; and

the fourth cable is connected to the slide-out room proximate to a lower corner at the rear end of the slide-out room.

7. The slideable room assembly of claim **1**, wherein movement of the slide-out room via tensioning of one of the four drive cables tensions at least one of the remaining four drive cables.

8. The slideable room assembly of claim **7**, wherein the first, third, an fourth drive cables are activated in unison.

9. The slidable room assembly of claim **1**, wherein the first drive cable and second drive cable are interconnected via a first segment of the drive chain at the first loose end.

10. The slidable room assembly of claim **1**, wherein the first drive cable is coupled to the first loose end with a first cable connector and the second drive cable is coupled to the first loose end with a second cable connector.

11. The slidable room assembly of claim **10**, wherein the first cable connector is spaced apart from the second cable connector along a first segment of the drive chain at the first loose end.

12. A drive assembly for reciprocating a slide-out room, the slide-out room having a pair of opposing sidewalls and being insertable within an opening in a vehicle body, the drive assembly comprising:

a strand of drive chain configured to move in a first or second rotational direction in a first plane, the strand of drive chain having a pair of loose ends that are unconnected to each other; and

at least four drive members, the at least four drive members including:

a first drive member connected to a first of the pair of loose ends of the drive chain and extending therefrom to a first end of the slide-out room,

a second drive member connected to the first loose end of the drive chain and extending therefrom in a direction opposite to the first drive member to a second end of the slide-out room, the second end of the slide-out room being opposite the first end of the slide-out room,

a third drive member connected to a second of the pair of loose ends of the drive chain and extending therefrom to the first end of the slide-out room, and

a fourth drive member connected to the second loose end of the drive chain and extending therefrom in a direction opposite to the third drive member to the second end of the slide-out room, and

wherein actuation of the drive chain in the first rotational direction engages one of the four drive members to move the slide-out room in a forward direction, and such forward movement of the slide-out room engages at least one of the remaining four drive members to thereby pull the slide-out room in the forward direction,

wherein the drive members operate in a second plane that is parallel to the first plane.

13. The drive assembly of claim **12**, wherein the four drive members maintain the slide-out room in a uniform orientation relative to the vehicle as the slide-out room moved towards a retracted position or an extended position.

14. The drive assembly of claim **12**, wherein the slide-out is balanced on at least one balancing member coupled to the vehicle proximate the opening.

15. The drive assembly of claim **14**, wherein the balancing member is at least one roller and/or at least one wear strip.

16. The drive assembly of claim **12**, further comprising a jamb assembly arranged about the opening in the vehicle and housing the drive chain and a motor, wherein the motor is configured to actuate the drive chain.

17. The drive assembly of claim **16**, further comprising a system for controlling velocity of the motor, wherein the system includes a controller that adjusts voltage supplied to the motor based on back EMF readings monitored by the controller.

18. The drive assembly of claim **17**, wherein the motor comprises a pair of motors, each of the pair of motors being arranged in opposite portions of the jamb assembly, wherein the controller adjusts voltage supplied to a first of the pair of motors based on back EMF readings of a second of the pair of motors.

19. The drive assembly of claim **12**, wherein at least one of the at least four drive members is adjustably connected to the slide-out room.

20. The drive assembly of claim **19**, wherein at least one of the at least four drive members is adjustably connected to a bracket that is secured to the sidewall of the slide-out room.

21. The drive assembly of claim **12**, wherein at least one of the at least four drive members is adjustably connected to the drive chain.

22. The drive assembly of claim **21**, wherein at least one of the at least four drive members is adjustably connected to a coupling that is secured to the drive chain.

23. The drive assembly of claim 22, wherein the coupling adjustably connects the first drive member and the second drive member and/or adjustably connects the third drive member and the fourth drive member.

24. A drive assembly for reciprocating a slide-out room, the slide-out room having a pair of opposing sidewalls and being insertable within an opening in a vehicle body, the drive assembly comprising: at least four drive cables and a driver member, each of the at least four drive cables having chain ends at which they are coupled to the driver member and room ends at which they are coupled to the slide-out room, wherein

the driver member is a U-shaped strand of chain with a pair of ends that are unconnected to each other, the driver member being configured to tension or slacken the at least four drive cables upon actuation of the driver member, and

actuation of the driver member in a first direction tensions at least one of the at least four drive cables to move the slide-out room relative to the opening in the vehicle body, and movement of the slide-out room tensions at least one of the remaining at least four drive members

wherein a first cable of the at least four drive cables extends from a first end of the drive member in a direction opposite of a second cable of the at least four drive cables, the first cable and second cable extending along a first common line.

25. The drive assembly of claim 24, wherein the driver member is a driver sprocket configured to rotate the U-shaped chain arranged around at least a portion of the driver sprocket, the at least four drive cables being coupled to the U-shaped chain.

26. The drive assembly of claim 25, wherein the U-shaped chain is a strand of chain having an opposing pair of free chain ends.

27. The drive assembly of claim 24, wherein each of the at least four drive cables is a discrete cable strand, each cable strand having opposite free cable ends, a first opposite free cable end of the discrete cable strands being connected to the drive member and a second opposite free cable end being connected to the slide-out room.

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